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ENCYCLOPÆDIA BRITANNICA

SEVENTH EDITION.

THE

ENCYCLOPÆDIA BRITANNICA

OR

DICTIONARY

OF

ARTS, SCIENCES, AND GENERAL LITERATURE.

SEVENTH EDITION,

WITH PRELIMINARY DISSERTATIONS ON THE HISTORY OF THE SCIENCES,

AND

OTHER EXTENSIVE IMPROVEMENTS AND ADDITIONS;

INCLUDING THE LATE SUPPLEMENT.

A GENERAL INDEX,

AND NUMEROUS ENGRAVINGS.

VOLUME XIII.

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ENCYCLOPÆDIA BRITANNICA.

L.

L, A SEMI-VOWEL, or liquid, forming the eleventh letter of the alphabet. It is derived from the old Hebrew lamed, or Greek lambda λ. It is sounded by intercepting the breath between the tip of the tongue and the fore part of the palate, with the mouth open, and makes a sweet sound, with something of an aspiration; hence the Britons and Spaniards usually doubled it, or added an *h* to it, in the beginning of words, as in *llan*, or *lhan*, a temple, sounding nearly like *fl*. In English words of one syllable it is doubled at the end, as *tell, bell, knell;* but in words of more syllables than one it is single at the end, as *evil, general, constitutional.* It is placed after most of the consonants in the beginning of words and syllables, as *black, glare, adle, eagle,* but before none. Its sound is clear in *Abel*, but obscure in *able*, and the like.

As a numeral letter, L denotes 50; and with a dash over it, thus, $\overline{L}$, 5000. Used as an abbreviation, this letter stands for Lucius; whilst L. L. S. represents a sesterce. (See SESTERCE.) LA is the syllable by which Guido denotes the last sound of each hexachord. If it begins in C, it answers to our A; if in G, to E; and if in F, to D.

LAALAND, an island in the Baltic Sea, being one of the portions of the kingdom of Denmark. It extends in north latitude from 54. 38. 30. to 54. 57. 30., and in east longitude from 10. 53. 1. to 11. 46. 2. and contains 470 square miles. It comprehends five cities or towns, and sixty-nine parishes, with 42,700 inhabitants. The soil is of moderate fertility, but the whole industry being applied to agriculture, it yields a surplus of corn, butter, meal, flax, honey, and wax. The land communication with the capital is over the island of Falster. The roads are in a most miserable condition.

LAARAT ISLE is situated off the north-eastern extremity of Timorlaut, in the Eastern Seas. It is about twenty-five miles in length by twelve in average breadth. Little is known, however, respecting its inhabitants or its productions.

LABADIE, JOHN, a French enthusiast, son of John Charles Labadie, governor of Bourges and gentleman in ordinary of the bed-chamber to the French king, was born in 1610. He entered young into the Jesuits' College at Bordeaux, which, by his own account, he afterwards quitted; but, according to others, he was expelled from it for his peculiar notions, and particularly for hypocrisy. He became a popular preacher; but being repeatedly detected in working upon female devotees with spiritual instructions for improper purposes, his loss of character with the Catholics forced him to seek for refuge amongst the Protestants. A reformed Jesuit being thought a great acquisition, he was precipitately accepted as pastor of Montauban, where he officiated for eight years; but having attempted the chastity of a young lady whom he could not convert to his purpose, and quarrelled with the Catholic priest about the right of interring a dead body, he was at length banished from that place. Driven out of Montauban, Labadie went to seek an asylum at Orange; but not finding himself so safe there as he imagined, he withdrew privately to Geneva, where he imposed on the people by his zealous preaching and devout carriage. From Geneva he proceeded to Middleburg, where his spirituality made him and his followers be considered as so many saints, and distinguished by the name of *Labadists.* They increased so much, that he excited the attention of the other churches, whose authority he disputed, till he was formally deposed by the synod of Dordrecht. But instead of obeying, he procured a tumultuous support from a crowd of his devotees; and at length formed a little settlement between Utrecht and Amsterdam, where he erected a printing press, which sent forth many of his works. He was, however, betrayed by some deserters, who exposed his private life, informing the public of his familiarities with his female disciples, under pretence of uniting them more particularly to God; and he was finally obliged to retire to Altona, where he died in 1674.

LABADISTS, a sect of religionists in the seventeenth century, followers of the opinions of John Labadie. Some of their opinions were, that God could, and did, deceive men; that, in reading the Scriptures, greater attention should be paid to the internal inspiration of the Holy Spirit than to the words of the text; that baptism ought to be deferred until mature age; that the good and the wicked entered equally into the old alliance, provided they descended from Abraham, but that the new admitted only spiritual men; that the observation of Sunday was a matter of indifference; that Christ would come and reign a thousand years upon earth; that the eucharist was only a commemoration of the death of Christ, and that, though the symbols were nothing in themselves, yet that Christ was spiritually received by those who partook of them in a due manner; that a contemplative life was a state of grace and of divine union during this life; that the man whose heart is perfectly content and calm, half enjoys God, has familiar entertainments with him, and sees all things in him; and that this state was to be come at by an entire self-abnegation, by the mortification of the senses and their objects, and by the exercise of mental prayer.

LABARUM, the banner or standard borne before the Roman emperors in the wars. The *labarum* consisted of a long lance, with a staff on the top, crossing it at right angles, from which hung a rich streamer, of a purple colour, adorned with precious stones. Till the time of Constantine it had an eagle painted on it; but, instead of this, that emperor added a cross, with a cipher expressing the name of Jesus. This standard the Romans took from the Germans, Dacæ, Sarmatæ, Pannonians, and other Teutonic tribes, whom they had overcome. The name of *labarum* was not known before the time of Constantine; but the standard itself, in the form we have described it, except the symbols of Christianity, was used by all the preceding emperors. Some derive the word from *labor*, as if this finished their labours; some from ἐυλαϐεια, *reverence, piety*; others from λαμϐανειν, *to take*; and others from λαφυϱα, *spoils*.

LABAT, John Baptist, a celebrated traveller, of the order of St Dominic, was born at Paris in 1663, taught philosophy at Nancy, and, in 1693, went to America in the quality of missionary. On his return to France in 1705, he was sent to the chapter of his order at Bologna to give an account of his mission, and resided several years in Italy. He died at Paris in 1738. His principal works are, 1. Nouveaux Voyages aux Iles de l'Amérique, in six vols. 8vo; 2. Voyages en Espagne et en Italie, in eight vols. 12mo; 3. Nouvelle Relation de l'Afrique Occidentale, in five vols. 12mo; 4. Voyage du Chevalier des Merchais en Guinée, in four vols. 12mo; 5. La Relation Historique de l'Ethiopie Occidentale, translated from the Latin of Father Cavazzi, in four vols. 12mo; 6. Les Mémoires du Chevalier d'Arvieux, containing his Travels to Constantinople and Asia Minor, in six vols. 12mo.

LABEL, a long, thin, brass rule, with a small sight at one end, and a hole at the other, commonly used with a tangent line on the edge of a circumferentor.

Label, in *Law*, is a narrow slip of paper, or parchment, affixed to a deed or writing, to hold the appending seal. Any paper annexed by way of addition or explication, to any will or testament, is also called a label or codicil.

Label, in *Heraldry*, a fillet usually placed in the middle along the chief of the coat, without touching its extremities. Its breadth ought to be a ninth part of the chief. It is adorned with pendants, and when there are above three of these, the number should be specified in blazoning. It is used on the arms of eldest sons whilst the father is alive, to distinguish them from the younger; and is esteemed the most honourable of all differences.

LABEO, C. Antistius, a celebrated lawyer of the age of Augustus and Tiberius, was son of Antistius Labeo, who formed one of the conspiracy against Cæsar, and, after the unsuccessful battle of Philippi, caused himself to be put to death by one of his own slaves. His son seems to have inherited all the independent principles of the father, and to have expressed at times his opinions respecting the measures of Augustus with such freedom, that it was thought by his friends that he was subject to fits of insanity. (Hor. *Sat.* i. 3, 82; Suet. *Aug.* 54.) Some say that he was offered the consulship by Augustus, but that he refused the honour, lest he should be suspected of having sold his independence to the emperor. Others say that he was a candidate for the consulship, and that Augustus caused M. Ateius Capito to be elected in preference to him. (Tacit. *Ann.* iii. 75.) He had applied himself more particularly to the study of law, and left many works, of which scarcely any thing remains except the title; eight books on *Probabilities*, of which Julius Paulus made an abridgment; a work in forty-two books, entitled *Posteriores*, because it appeared after his death. Of these two works fragments are to be found in the pandects of Justinian. The latter is abridged by Jabolenus, who flourished under Trajan. (Gell. xiii. 10.) His other works are, Commentaries on the Twelve Tables, and on the Edicts of the Prætor and Curile Æediles; a Treatise on the Prætor Urbanus and Peregrinus; a Treatise on Pontifical Law, in fifteen books. It is disputed whether some other works mentioned by St Augustin belong to this Labeo, or to another of the same name. (See *Opuscula varia* of Bynkershöck, Leyd. 1719; *De Vita, Moribus, et Studiis Labeonis et Capitonia*, Utrecht, 1692.)

LABERIUS, Decimus, a Roman knight, who was particularly distinguished as a writer of mimi, that is, farces in the language of the common people, and for their amusement. The exact period of his birth is unknown, but he died B. C. 43, a few months after the murder of Cæsar. Having caused some annoyance to the dictator by the freedom of his language, he was ordered by him to appear on the stage as an actor in one of his own plays, when he had reached the age of sixty. The prologue which he pronounced on this occasion is preserved by Macrobius (*Sat.* ii. 7), and is so beautiful that it makes us regret that more of his writings have not come down to us. When he had finished, he proceeded towards the places assigned to the knights; but his appearance on the stage had deprived him of all the privileges enjoyed by that order, and no one was willing to make way for him. Cicero, observing his embarrassment, said, in allusion to the number of new senators admitted by Cæsar, "Recepissem te nisi anguste sederem;" upon which Laberius sarcastically replied, "Mirum si anguste sedes qui soles duabus sellis sedere," thereby reproaching Cicero with his versatility of conduct. We have the titles of forty of his pieces (see Fabricius, *Biblioth. Lat.* i. p. 477), but only a few fragments of them have been preserved. They have been published by Stephanus, Paris, 1564; and are also found in the *Catalecta veterum Poetarum* by Scaliger, and in the *Epigrammata vetera*, Lyons, 1596.

LABIAL Letters, those pronounced chiefly by means of the lips.

LABIAU, a city of East Prussia, in the government of Königsberg, the capital of a circle of the same name. It stands on the river Deine, and is connected by a canal with the Pregel. It is fortified, and contains 290 houses, with 2630 inhabitants, who export considerable quantities of tallow and of linseed. Long. 21. 1. 25. E. Lat. 54. 51. 20. N.

LABOOAN, an island off the north-west coast of Borneo, to which the English retired in 1775, when they were expelled by the Sooloos from Balambangan. Long. 115. E. Lat. 5. 20. N.

LABORATORY, the chemist's workhouse, or the place where furnaces are built, vessels kept, and operations performed. In general the term *laboratory* is applied to any place where physical experiments in pharmacy, chemistry, pyrotechny, and the like, are performed. See Chemistry.

Laboratory, in military affairs, signifies that place where all sorts of fire-works are prepared, both for actual service and for experiments, viz. quick matches, fuzes, port-fires, grape-shot, case-shot, carcasses, hand-grenades, cartridges, shells filled, and fuzes fixed, wads, &c.

LABOUREUR, JOHN LE, almoner to the king of France, and prior of Juvigne, was born at Montmorency, near Paris, in 1623. At the age of eighteen he distinguished himself by publishing a Collection of the Monuments of Illustrious Persons buried in the church of the Celestines at Paris, with their elegies, genealogies, arms, and mottos, in 4to. He afterwards published an edition of the Memoirs of Michel de Castelneau, with several other genealogical histories. He had a brother, Louis le Laboureur, bailiff of Montmorency, author of several pieces of poetry; and an uncle, Dome Claude le Laboureur, provost of the abbey of L'Isle Barbe, of which he wrote a history, and published notes and corrections on the breviary of Lyons. Laboureur died in 1675.

LABRADOR, a vast region of North America, nearly of a triangular shape, extending from the fiftieth to the sixty-first degree of north latitude, and from fifty-six to seventy-eight of west longitude. It is bounded on the south by Canada and the Gulf of St Lawrence, on the east by the Atlantic Ocean, on the north by Hudson's Straits, and on the west by Hudson's Bay. Being thus detached from the arctic lands, Labrador ought to partake in some degree of the nature of the temperate cold regions; but, from causes which do not appear to be very obvious, it is a country as frozen, desolate, and barren, as those to the west of Hudson's Bay. The coast along that spacious inland sea is called East Main, and the climate there is peculiarly rigorous. The whole surface of Labrador, indeed, is as sterile and naked as any part of the globe. The prevailing features are rocks, swamps, and water; and vegetation appears as the last effort of expiring nature. Small scraggy poplars, stunted firs, creeping birch, and dwarf willows, thinly scattered in the southern parts, constitute the whole of the trees; herbs and grass are also in sheltered places to be met with; but in the most northerly parts only varieties of moss and lichens are to be found. The whole of the interior, from the aspect of what has been explored, and from the reports of the Esquimaux and other Indians, seems to be broken up with rivers, lakes, and rocks. The geological features of the Labrador coast are as follow:[1]—The prevailing rock contiguous to the sea shore is gneiss. On this, at L'Anse à Loup, the most fertile part of the country, a bed of old red sandstone, about two hundred feet thick, is superimposed, and extends about half a mile inland. Here also, as on every other part of the coast visited by the individual from whom our information is derived, the appearances of the cliffs and of the land near them, and the rolled masses inland, which have evidently been exposed to the action of the sea, seem to prove that the latter has considerably receded. The sandstone is generally red and white in alternate strips, and presents a remarkable mural front to the sea. Near the surface it was strongly marked with iron. The whole of the rock was composed of white quartz and yellow felspar; and the grains were generally as fine as oatmeal, though occasionally coarser, even to the extent of half an inch in diameter. Over the red sandstone was a thin stratum of red compact felspar, containing vegetable impressions, and also horizontal. Above this were varieties of secondary limestone arranged in parallel strata several feet thick and full of shells. Detached masses of primitive limestone were also found; and, a few miles from the shore, the secondary formations generally disappeared, leaving gneiss and mica slate on the surface. North of Cape Charles, on the Labrador coast, the land falls back to the westward, and the shore changes its character, becoming shoal, and running off in flats; whereas to the southward it is bold and abrupt. The prevailing rock, however, is still gneiss, containing numerous veins of granite, from a few inches to many feet in thickness, the constituent parts being mica, quartz, and felspar. The diameter and dip of the gneiss rock is here, as elsewhere on the coast, to the north-west, and at an angle of nearly 65°. It is coarse and dark, hornblende taking the place of mica, and frequently very light-grayish felspar forming the chief constituent. Where this occurs, the face of the hill has a remarkably spotted appearance. On one of the islands which here skirt the coast, a large bed of primitive greenstone was found, forming a range of hills resting on the gneiss, and appearing to have the same direction. On the western part of these islands also the gneiss gives place to mica slate, this commencing beyond the above-mentioned range of greenstone, which appears to mark the line of demarcation between them. The mica slate then predominates through all the islands and shores examined to the westward of this point, viz. to the Mealy Mountains, in Sandwich Bay, a distance of about thirty-five miles. In some places crystals of garnet are very abundant in it, and in others considerable beds of granite were found, of a confused appearance, and in which quartz and felspar predominated. The Mealy Mountains are the highest land on this coast, and were computed to be about 1484 feet in height, covered nearly to the top with wood, notwithstanding the severity of the climate. They are of mica slate, with a dark, fine-grained formation of the same, resembling basalt, at their base. The general rock is coarse-grained. At the foot of these mountains were also found beds eight and ten feet thick, and large rolled masses of a remarkable conglomerate rock, of which the basis was composed of grains of mica, quartz, and felspar; and the imbedded masses were large rounded pebbles of quartz, mica slate, felspar, hornblende, granite, and gneiss. The whole was very hard, and elicited sparks of fire under the stroke of the hammer. The imbedded fragments were all water-worn.

The general aspect of different parts of the Labrador coast has been described by the Moravian missionaries, from whom we learn that Nullatarlok Bay, in 59° north latitude, is surrounded by high mountains, which are covered with moss, alder, birch, and various shrubs and plants, the valleys in July being grassy and enamelled with a great variety of flowers. The rocks are slaty, easily splitting into plates of from four to eight feet square. At Nachvak Bay the sea was clear of ice in the middle of July, and the magnificent mountains around afforded to the missionaries a most enchanting prospect. Oppernavik, lying between the sixtieth and sixty-first degrees of north latitude, is not far distant from Cape Chudleigh, where the coast, which was hitherto north, now trends to the south-south-west, embosoming a spacious expanse of water called Ungava Bay. The river Kangertluksoak, in latitude 58. 57. north, is about 140 miles south-south-west of Cape Chudleigh. The estuary of the Koksoak lies in 58. 36. north latitude, at the distance of about 650 miles from the Moravian station Okkak, and is as broad as the Thames at Gravesend. Up the river there is a bay surrounded on all sides by gently rising ground, well wooded with trees of moderate size. For about half a mile a fine slope extends, bounded on each extremity by a hill. The Moravians describe the land as level and dry, watered by rivulets issuing from the woods, in which were found various European plants and flowers, different kinds of shrubs, such as junipers, currants, and the like, and grass and trees in abundance. The missionaries were informed that, further west, no wood grows along the coast. The soil at L'Anse à Loup is rich, and it is much the most eligible part of Labrador for settlers. Corn will not ripen, but serves for green food; and potatoes, cabbages, lettuce, spinach, and early Dutch turnips, do well. There is generally much rain on the whole coast, but now the temperature would appear to be more equable than it was some fifty years ago, if we may trust to the correctness of the reports of navigators. The current always sets to the southward along the coast. The tides rise six feet to the northward, and about four to the southward. The prevailing winds are from west-south-west to north-west. There is less fog than farther south; and the Straits of Belleisle, which separate Newfoundland from Labrador and the continent of America, are never frozen over.

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[1] For this account of the geology of Labrador, we are indebted to a paper by Captain H. Robinson, R. N. published in the Journal of the Royal Geographical Society of London, 1834.

On the coast of Labrador the winter is extremely severe, the thermometer often falling thirty degrees below the freezing point; and although the houses of the Moravian missionaries are heated by large cast-iron stoves, the windows and walls are all the winter covered with ice, and the bed-clothes freeze to the walls. Rum is frozen in the air as rapidly as water, and rectified spirits soon become thick like oil. From December to June the sea is completely frozen over; and so intense is the cold during the winter months, that travelling is sometimes attended with the most painful consequences. The summer months, again, are extremely hot along the coast, the thermometer rising to eighty-six degrees of Fahrenheit, when swarms of musquitoes infest the air. The climate, however, is not insalubrious; and, notwithstanding all its disadvantages, Labrador is of considerable importance to Great Britain. No country is better provided with large, convenient, and safe harbours, or supplied with better water; and vast multitudes of all those kinds of fish common to the arctic seas abound on the coast. Herrings are very fine and plentiful in August, but there is no weather to cure any kind of fish after the 10th of September. The rivers are frequented by salmon and sea trout; and pike, barbel, eels, river trout, and the like, are likewise found in them. On the numerous islands which are scattered along the east coast, multitudes of eider-ducks and other water-fowl breed. Those of large size have deer, foxes, and hares, upon them. On the continent the wild animals are principally bears, wolves, foxes, and otters; beavers and deer are not numerous, but their furs are remarkably close and beautiful. The birds of the country are the white-tailed eagle, falcons, hawks, and owls of various kinds; raven, white grouse, ptarmigan, spruce-game, whistling curlew, gray plover, various kinds of sand-pipers and other waders; geese, ducks of various sorts, shags, gulls, divers, and some few species of small birds. During the short summer, insects are very numerous, especially in swampy places. In winter they exist in a state of torpidity, from which they are aroused by the solar heat or artificial warmth. The phenomenon of the aurora borealis is uncommonly brilliant in this region, and exercises a very marked influence over the compass.

The exports of Labrador consist of the products of the country, fish, oil, and fur. During the fishing season, from 280 to 300 schooners proceed from Newfoundland to the different fishing stations on the coast, where about 20,000 British subjects are employed for the season. About one third of these vessels make two voyages, loaded with dry fish, back to Newfoundland, during the summer; and several merchant vessels proceed from Labrador with their cargoes direct to Europe, leaving generally full cargoes for the fishing vessels to carry to Newfoundland. A considerable part of the fish of the second voyage is in a green or pickled state, and dried afterwards at Newfoundland. Quebec sends eight or nine vessels to the coast, manned with eighty or one hundred fishermen. Part of the fish caught by them is sent to Europe, and the remainder is carried to Quebec; besides which, they carry annually about L.6000 worth of furs, oil, and salmon to Canada. From one hundred to one hundred and twenty vessels come from Nova Scotia and New Brunswick. The principal part of their cargoes goes home in a green state. From 16,000 to 18,000 seals are taken at Labrador in the beginning of winter and spring. They are of a very large size, and the winter residents on the coast are said to feast and fatten on their flesh, which, when young, they account excellent eating. About 4000 of these seals are killed by the Esquimaux. The whole number caught produce about 350 tons of oil, the value of which may be about L.8000. One third of the resident inhabitants are British servants, who take charge of the property left, and likewise employ themselves, in the spring and fall, catching seals. The other two thirds live constantly at Labrador, and act in the capacity of furriers and seal catchers on their own account, but chiefly as the former during the winter; in summer all are engaged in the fisheries. Half of these individuals are Jerseymen and Canadians, most of whom have families. There are six or seven English houses, and four or five Jersey houses, established at Labrador, unconnected with Newfoundland, who export their oil and fish directly to Europe. The quantity exported to the Mediterranean in 1830 was about

50,000 quintals cod fish, at 10s	L.25,000
900 tierces salmon, at 60s	2,700
To England, about 200 tons cod oil	4,000
200 do. seal do	4,500
Furs	3,000
	L.39,200
By Newfoundland houses, 20,000 quintals cod fish, at 10s	10,000
300 tierces salmon, at 60s	900
Total direct export from Labrador	L.50,100
Produce sent direct to Newfoundland from Labrador:	
24,000 quintals cod fish, 9s. best quality	10,800
300,000 quintals cod fish	127,500
1500 tuns cod oil, at L.18	27,000
Salmon, &c	3,000
Fish, &c. sent to Canada, about	10,000
Ditto carried to Nova Scotia and New Brunswick, should be in value at least	50,000
Estimated value of the produce of Labrador, exclusive of what the Moravians send to London[1]	L.278,400

The Labrador fishery has, since 1814, increased more than sixfold, principally in consequence of our fishermen being driven from the grounds now occupied by the French.[1]

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[1] These statements are made at the most depressed prices, and not at the average prices, which would increase the gross value to L.312,400. The Americans of the United States had, in 1829, about 500 vessels and 15,000 men employed on the coast, and their "catch" amounted to 1,100,000 quintals of fish, and about 3000 tuns of oil; value altogether, about L.610,000.

This vast country, equal in square miles to France, Spain, and Germany, has not a resident population exceeding 4000 inhabitants, including the natives and Moravians. The latter, an excellent and truly Christian people, have several settlements on this stern, inhospitable shore; and nothing but the purest spirit of religion and philanthropy could induce them to remain, and zealously labour to enlighten the miserable and disgusting native population. The principal station is at Nain, on the north shore, where a ship annually arrives from London in July, laden with provisions and other necessaries. At Nain there are four missionaries, at Okkak three missionaries, at Hebron five missionaries, and at Hopedale four missionaries. The total number of brethren is twenty-nine; and there are 895 Esquimaux converts to Christianity, of whom about 320 are communicants. These Moravians appear to have come from Greenland about the middle of the last century, in the prosecution of their pious undertaking to enlighten the heathen. Their habits and mode of life are simple and quiet, corresponding to their isolated condition. Their trade is wholly with the Esquimaux, with whom they barter coarse cloths, powder, shot, guns, and edge-tools, for furs, oils, and other articles, the produce of the country. The Esquimaux, the most filthy and disgusting tribe yet discovered on the shores of America, are thinly scattered along the coast of Labrador. The greatest number of them in any one place appears to be at Invutoke Inlet, or Esquimaux Bay, on the Atlantic coast of Labrador, where there are about two hundred and fifty. (For a description of the Esquimaux, see the article GREENLAND). The Canadians and others residing at Labrador employ these people in catching fish, and the like. Labrador belongs to the government of Newfoundland. During summer there is a court held, from which appeals are made to the supreme court of St John's. An armed vessel visits, and continues generally along the coast, during the greater part of the fishing season. (R. R. R.)

LABRUM, in *Antiquity*, a great tub which stood at the entrance of the temples, containing water for the priests to wash in previously to their offering sacrifices. It was also the name of a tub used in the baths of the ancients.

LABY, or LABBE', one of the principal cities of the Foolah kingdom of Foota Jallou, in Western Africa. It is distant about seventy-two miles from Teembo, the capital, and contains about 5000 inhabitants, who carry on a considerable traffic with various towns on the river Nunez.

LABYRINTH, amongst the ancients, was a large, intricate edifice, cut out into various aisles and meanders running into one another, so as to render it difficult to find a passage through them. Mention is made of several of those edifices amongst the ancients; but the most celebrated were the Egyptian and Cretan labyrinths. That of Egypt, according to Pliny, was the oldest of all the known labyrinths, and subsisted in his time, after having stood three thousand six hundred years. According to him, it was built by King Petesucus, or Tithoes; but Herodotus makes it the work of several kings. It consisted of twelve large contiguous palaces, containing three thousand chambers, fifteen hundred of which were under ground. Strabo, Diodorus Siculus, Pliny, and Mela, speak of this monument with the same admiration as Herodotus; but not one of them tells us that it was so constructed as to bewilder those who attempted to explore it; although it is manifest that, without a guide, they who entered it would be in danger of losing their way. It was this danger, no doubt, which introduced a new term into the Greek language. The word *labyrinth*, taken in the literal sense, signifies a circumscribed space, intersected by a number of passages, some of which cross each other in every direction like those in quarries and mines, whilst others make larger or smaller circuits round the place from which they depart, like the spiral lines we see on certain shells. In the figurative sense, it was applied to obscure and captious questions, to indirect and ambiguous answers, and to those discussions which, after long digressions, bring us back to the point from which we had set out. The Cretan labyrinth is the most famous in history or fable, having been rendered particularly remarkable by the story of the Minotaur, and of Theseus, who found his way through all its windings by means of Ariadne's clue. Diodorus Siculus relates as a conjecture, and Pliny as a certain fact, that Dædalus constructed this labyrinth on the model of that of Egypt, though on a smaller scale. It was formed by the command of Minos, who kept the Minotaur shut up in it; but in their time it no longer existed, having been either destroyed by time, or purposely demolished. Diodorus Siculus and Pliny, therefore, considered this labyrinth as a large edifice; whilst other writers represent it simply as a cavern hollowed in the rock, and full of winding passages. The opinion of Diodorus and Pliny supposes that in their time no traces of the labyrinth existed in Crete, and that even the date of its destruction had been forgotten. Yet it is said to have been visited by the disciples of Apollonius of Tyana, who was contemporary with these authors. At that time, therefore, the Cretans believed that they possessed the labyrinth.

LAC OF RUPEES, is a hundred thousand rupees, which, supposing them standard, or siccas, at 2s. 6d., amounts to L.12,500 sterling.

LACCA, LAC, or *Gum-Lac*, is a substance out of which a species of insects form cells upon trees, like honeycombs. In these cells remain some of the dead insects, which give a red colour to the whole substance of the lac. That called *stick-lac* is the wax which adheres to some of the small branches of the tree, and is unprepared. This lac, when separated from the adhering sticks, and grossly powdered, and deprived of its colour by digestion with menstruums for the sake of the dyes and other purposes, is called *seed-lac*, which, when freed from impurities by melting it over a gentle fire, and formed into cakes, is called *lump-lack;* and, lastly, that called *shell-lac* consists of the cells liquefied, strained, and formed into thin transparent laminæ.

Artificial LACCA, or *Lacque*, is also a name given to a coloured substance obtained from several flowers, as the yellow from the flower of the juniper, the red from the poppy, and the blue from the iris or violet. The tinctures of these flowers are extracted by digesting them several times in aqua vitæ, or by boiling them over a stove fire in a lixivium of potashes and alum.

LACCADIVES, an archipelago of low islands lying off the Malabar or western coast of India, between the 8th and 13th degrees of north latitude. There are nineteen considerable ones; but as most of them are surrounded with reefs and steep rocks, with a great depth of water close to them, the approach to them is very dangerous. Between these islands there are many channels, through which ships from India, bound to Persia or Arabia, frequently sail. The safest of these is called Mamale, or the Nine-degree Channel, which runs between the islands of Seuhilipar and Kalpenny. The largest of these islands is about seven miles in length and two and a half in breadth. Most of them are inhabited by a race of Mahommedans called Moplays. They do not yield grain, but produce an infinite quantity of cocoa nuts, from the husks of which they form the *coir* cables, which are more elastic and durable than hemp, as the sea-water, instead of rotting, preserves them. These islands are well supplied with fish, and carry on a trade with the small shells called *cowries*, which pass as coin all over India. They are nominally dependent on Cannanore, but their poverty has been always their chief security. They were discovered by Vasco de Gama in 1499, but have since been little frequented by Europeans.

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[1] M'Gregor's *British America*, vol. i. p. 209; to which work we are indebted for the above facts relative to the trade of Labrador.

LACE, from *lacinia*, the guard hem or fringe of a garment, is a plain or ornamented network, consisting of threads of gold, silver, silk, flax, or cotton, tastefully interwoven so as to form a beautiful texture. This delicate fabric has no doubt claims to high antiquity, but its origin is involved in considerable obscurity. That it was worn by Grecian females is certain, and the derivation of the word *lace* affords presumptive evidence that it was also in use amongst the Romans. In Venice, and the neighbouring states of Italy, it was very early worn; and Mary of Medicis is supposed to have been the first who introduced its use into France; but as early as 1483 we find it included in a list of articles prohibited to be imported into England. The inference which may be drawn from this circumstance is, that it had begun to be made in this country *prior* to the period above mentioned, and that this prohibition, like many other subsequent acts, was for the protection and encouragement of home manufactures. But *pins*, which are indispensable in the process of lace-making, were not known till long afterwards; so that it is probable the fabric made was neither very fine in texture, nor produced to any great extent. It is uncertain by whom the manufacture of lace was originally introduced into this country, nor is it of great importance to know. About the middle of the seventeenth century, the lace trade was a flourishing concern in Buckinghamshire; and so greatly had it advanced in England, that, by a royal ordonnance in France, passed in 1660, a mark was established upon the thread lace imported from this country and from Flanders, and upon point-lace from Genoa, Venice, and other countries.

Pillow-lace, the original manufacture, is worked upon a hard-stuffed pillow, with silk, flax, or cotton threads, according to a parchment pattern placed upon it, by means of pins, bobbins, and spindles, which are placed and displaced, twisting and interweaving the threads, so as to imitate the pattern designed. This manufacture has been long pursued in many counties in England, and at various places on the Continent. Of the number of persons employed on the Continent no estimate can be formed; but at Brussels alone no less than 10,000 individuals are said to be engaged in the manufacture. It is supposed that the first lace ever made in this country was that called Brussels point, in which the network is made by bone bobbins on the pillow, and the pattern and sprigs are worked with the needle. This, from different portraits now in existence, appears to have been the kind worn in the time of Charles I. and during the reigns of several subsequent sovereigns. Various improvements have from time to time taken place in the manufacture of this article; but, about the year 1778, the point-ground was introduced by the inhabitants of Buckingham and its neighbourhood, which quickly superseded all the others. The origin of the modern pillow-lace may be dated from this period; but the most striking improvements did not take place till the commencement of the present century, and since then, for several years, they were astonishing and unprecedented. During the war, veils of this lace sold at a very high rate; but their value has been greatly depreciated by the introduction of the new manufacture, which is the product of machinery. Since 1815, the competition in this article has been very great, and the manufacture of pillow-lace has consequently declined so much as to be now in a very languishing condition.

The first who made lace by machinery was a frame-work knitter of Nottingham, about the year 1768. This individual employed his common stocking-frame in the manufacture; but, about the same time, another person in the same place introduced a machine ostensibly for lace, called a pin-machine. Single-press *point-net*, in imitation of the Brussels ground, was the article produced. In 1782 the warp-frame was introduced, and is still in use for making warp-lace. In 1809, Mr Heathcoat of Tiverton succeeded in discovering the correct principle of the bobbin-net frame, and obtained a patent for fourteen years for his invention. The expiration of this patent, combined with the application of steam-power, which had now become general, gave a great stimulus to the trade. The demand became immense, and prices fell in proportion as production increased. The Nottingham lace-frame became the organ of general supply, rivalling and supplanting in plain nets the most finished productions of France and the Netherlands. In a work relative to this manufacture, published in 1833, the state of the trade is given as follows:

Total capital employed in the trade.......	L.1,932,000
Total number of hands employed.............	159,300

The annual produce in 1831 was estimated at 23,400,000 square yards, worth L.1,891,875. In 1834, above 7,000,000 square yards more were annually produced, an increase which is understood to have arisen from the new and improved machinery introduced into the manufacture. A considerable increase has also taken place in bobbin-net machinery on the Continent, particularly at Calais, where, in 1823, there were not thirty-five machines, and probably not one hundred on the Continent altogether. According to the authority above mentioned, there are now above 700 machines at Calais alone; and the total number on the Continent has been estimated at 1850. The produce of these machines has been calculated at 9,824,000 square yards of net, of the value of L.570,250. The manufacture is now beginning to be established in different parts of Europe, where it has hitherto been unknown; and even from some places in Persia orders have been received in this country for bobbin-net frames; but government has restricted the exportation of machinery. The English manufacture from machinery is now confined to *point-net*, *warp-net*, and *bobbin-net*, so called from the peculiar construction of the machines by which they are produced. There were various other descriptions made, but they are now discontinued. Nottingham is the depôt of the lace trade; and the supplies collected from all the surrounding villages, and even from the more distant counties where it is manufactured, are thence distributed to various quarters of the world. The Nottingham trade is by no means in so prosperous a condition as it once was; a result which may probably be attributed to the great influx of capital and hands into the trade, which a successful novelty is at all times calculated to attract. An extraordinary increase in the powers of production followed; and as the demand for some time kept pace with the supply, the latter became a question of *quantity* rather than of *quality*, and a great depression of price was the consequence. From becoming cheap and common, lace lost its attractions in the fashionable circles, and has to a considerable extent been superseded by other kinds of manufacture. The natural result of the increase in power machinery, and the application of speedier machines, is to depress the condition of the workmen, and for some time they have suffered much; nor is any immediate amelioration likely to take place. The following observations on the importance of the trade to Britain are extracted from M'Culloch's *Dictionary of Commerce:* "By comparing the value of 1,270,000 lbs. of Sea Island cotton, worth L.148,000, and about L.10,000 worth of thrown silk, which appears to be annually used in this manufacture, with the manufactured value of the same, worked into 30,771,000 square yards of bobbin-net, the estimated value of which is L.1,850,650, the great national utility of this trade becomes at once evident. A clear surplus of more than a pound sterling is realized upon every pound avoirdupois of the raw material, which is distributed over the trade in rent, profit, and wages; and this is altogether independent of the profits arising from embroidering, in itself a most extensive and important branch. About half, or perhaps three fourths, of this production is supposed to be exported in a plain state, chiefly to Hamburg, the Leipsic and Frankfort fairs, Antwerp and the rest of Belgium, to France (contraband), Italy, Sicily, and North and South America. Of the remainder, three fourths are sold unembroidered, and the remaining fourth embroidered, in this country."

"The most celebrated laces are,—1. Brussels, the most valuable. There are two kinds: Brussels ground, having a hexagon mesh, formed by platting and twisting four threads of flax to a perpendicular line of mesh: Brussels wire ground, made of silk; meshes partly straight and partly arched. The pattern is worked separately, and set on by the needle. 2. Mechlin: a hexagon mesh, formed of three flax threads twisted and platted to a perpendicular line or pillar. The pattern is worked in the net. 3. Valenciennes: an irregular hexagonal, formed of two threads, partly twisted and platted at the top of the mesh. The pattern is worked in the net similar to Mechlin lace. 4. Lisle: a diamond mesh, formed of two threads platted to a pillar. 5. Alençon, called blond: hexagon, of two threads, twisted similar to Buckingham lace; considered the most inferior of any made on the cushion. 6. Alençon point: formed of two threads to a pillar, with octagon and square meshes alternately.

"The French nets made by machinery are,—1. Single-press point, called, when not ornamented, *tulle*, and when ornamented, *dentelle*, made of silk; is an inferior net, but is attractive, from the beautiful manner in which it is stiffened: 2. Trico Berlin; so called from being invented at Berlin, and the stitch being removed three needles from its place of looping; is fanciful and ornamented in appearance, but not in demand in England: 3. *Fleur de Tulle*, made from the warp-lace machine; mesh of two descriptions, which gives a shaded appearance to the net: 4. *Tulle Anglois* is double-pressed point-lace: 5. and 6. Bobbin-net and warp-net, principally made by English emigrants, who have settled in France."

Mr Babbage gives the following account of lace made by the *phœlena pandilla* or caterpillar. The invention is by a gentleman of Munich. He makes a paste of the leaves of the plant which is the usual food of the species of caterpillar he employs, and spreads it thinly over a stone or other flat substance; then, with a camel-hair pencil dipped in olive oil, he draws upon the coating of paste the pattern he wishes the insects to leave open. The stone being placed in an inclined position, a species of caterpillar which spins a strong web is laid at the bottom, and the animals, commencing from that point, eat and spin their way up to the top, carefully avoiding every part touched by the oil, but devouring all the rest of the paste. These veils have not a great deal of strength, but they are surprisingly light. One of them, measuring twenty-six inches and a half by seventeen inches, weighed only 1·51 grain; a degree of lightness which will appear more strongly by contrast with other fabrics. One square yard of the substance of which these veils are made weighs four grains and three fourths, whilst one square yard of silk gauze weighs 137 grains, and one square yard of the finest patent net weighs 262½ grains.

Method of Cleaning Gold Lace and Embroidery when tarnished.—For this purpose alkaline liquors are by no means to be used; because, whilst they clean the gold, they corrode the silk, and change or discharge its colour. Soap also alters the shade, and even the species of certain colours. But spirit of wine may be employed without any danger of its injuring either the colour or quality of the subject; and in many cases it proves as effectual, for restoring the lustre of the gold, as the corrosive detergents. A rich brocade, flowered with a variety of colours, after being disagreeably tarnished, had the lustre of the gold perfectly restored by washing it with a soft brush dipped in warm spirit of wine; and some of the colours of the silk, which were likewise soiled, became at the same time remarkably bright and lively. Spirit of wine seems to be the only material adapted to this purpose, and probably the boasted secret of certain artists is no other than this spirit disguised. Amongst liquids, Dr Lewis says, he does not know of any other that is of sufficient activity in discharging the foul matter, without being hurtful to the silk. As to powders, however fine, and however cautiously used, they scratch and wear the gold, which here is only superficial, and of extreme tenuity. But though spirit of wine is the most innocent material that can be employed for this purpose, it is not in all cases proper. The golden covering may be in some parts worn off, or the base metal with which it had been iniquitously alloyed may be corroded by the air, so as to leave the particles of the gold disunited, whilst the silver underneath, tarnished to a yellow hue, may continue of a tolerable colour; in which cases it is apparent that the removal of the tarnish would be prejudicial to the colour, and make the lace or embroidery less like gold than it was before. A piece of old tarnished gold lace, cleaned by spirit of wine, was deprived, with its tarnish, of the greater part of its golden hue, and looked almost like silver lace.

Method of separating the Gold and Silver from Lace without burning it.—Cut the lace in pieces, and, having separated the thread from it by which it was sewed to the garment, tie it up in a linen cloth, and boil it in soap ley diluted with water, till it becomes diminished in bulk, which will require but little time, unless the quantity of lace be very considerable. Next take out the cloth, and wash it several times in cold water, squeezing it pretty hard with your foot, or beating it with a mallet, to clear it of the soap ley; then untie the cloth, and you will have the metallic part of the lace pure, and nowhere altered in colour or diminished in weight. This method is much more convenient and less troublesome than the common way of burning; and as a small quantity of the ley will be sufficient, the expense will be trifling, especially as the same ley may be used several times, if cleared of the silky calcination. The ley may be had at the soap-boilers, or it may be made of pearl ash and quicklime boiled together in a sufficient quantity of water. The reason of this sudden change in the lace will be evident to those who are acquainted with chemistry. For silk, on which all our laces are woven, is an animal substance, and all animal substances are soluble in alkalies, especially when rendered more caustic by the addition of quicklime; but the linen in which it is tied, being a vegetable, will remain unaltered.

Blond Lace, a lace made of fine linen thread or silk, much in the same manner as that of gold and silver.

LACEDÆMON, in fabulous history, a son of Jupiter, and Taygeta the daughter of Atlas, who married Sparta the daughter of Europa, by whom he had Amyclas, and Eurydice the wife of Acrisius. He was the first who introduced the worship of the Graces into Laconia, and who built them a temple. From Lacedæmon and his wife, the capital of Laconia was called *Lacedæmon* and *Sparta*.

Lacedæmon, a noble city of Peloponnesus, called also *Sparta*, names which differed in this, that the latter was the proper and ancient name of the city, whereas the former was that of the country, though it afterwards came to be applied to the city. Homer also makes this distinction, when he calls the country *holy*, because encompassed with mountains. It has likewise been known by the name of *Lelegia*, from the Leleges, the first inhabitants of the country, or from Lelex, one of their kings; and *Œbalia*, from *Œbalas*, the sixth king after Eurotas. It was called *Hecatompolis*, from the hundred cities which the whole province once contained. This city was the capital of Laconia, situated on the right or western side of the Eurotas; and it was less in compass than Athens. Polybius makes it forty-eight stadia, a circuit much inferior to that of Athens. Lelex is supposed to have been the first king of Lacedæmon. His descendants, thirteen in number, reigned successively after him, till the reign of the sons of Orestes, when the Heraclidæ recovered the Peloponnesus, about eighty years after the Trojan war. Procles and Eurysthenes, the descendants of the Heraclidæ, usurped the crown; and after them it was decreed that the two families should always sit on the throne together. The monarchical power was abolished, and the race of the Heraclidæ extinguished, at Sparta, about 219 years before Christ. Lacedæmon in its flourishing state remained without walls, the bravery of its citizens forming its only defence. At length, in Cassander's time, and afterwards, when the city was in the hands of tyrants, the latter, distrusting the defence by arms and bravery, built a wall around it, which the tyrant Nabis made very strong. Pausanias ascribes the first walls to the times of Demetrius and Pyrrhus, under Nabis. More than a century and a half before Christ, the walls of the city were pulled down by Philopœmen, who was then at the head of the Achæan League; and Laconia some time afterwards became a Roman province, when reduced by Mummius. (See Sparta.) The present city is called *Misitra*.

LACEDONIA, a city of the kingdom of Naples, in the province of Principato-Ulteriore. It stands on a hill, is the seat of a bishop, and contains 4550 inhabitants.

LACEPEDES, a group of small islands on the north-western coast of New Holland, extending about thirty-six miles from north to south, near the shore, and the largest being about nine miles long. The surrounding seas abound in whales, and fishes of different kinds. Long. 117. 8. E. Lat. 16. 43. N.

LACERNA, a coarse, thick garment worn by the Romans over their gowns, like a cloak, to keep out the rain and the cold. It was first used in the camp, but afterwards admitted into the city. The emperors wore the lacerna of a purple die. The lacerna, at first very short, was lengthened after it became fashionable, which was not till the civil wars and the triumvirate; before this time it was confined to the soldiers. Senators were forbidden to wear it in the city by Valentinian and Theodosius. Martial makes mention of lacernæ worth ten thousand sesterces. Some confound this garment with the penula; but it seems rather to have resembled the *chlamys* and *birrus*.

LA CHARITE', a city of France, in the department of the Nièvre, and arrondissement of Cosne. It is finely situated on the side of a hill, looking down on the Loire. It contains 590 houses, and 5300 inhabitants, who carry on the trades of tanners, hatters, serge and button makers. Long. 2. 56. E. Lat. 47. 10. N.

LACHES (from the French *lascher*, that is, *laxare*, or *lasche ignavus*), in the English law, signifies slackness or negligence, as appears from Littleton, where *laches of entry* is a neglect of the heir to enter.

LACHESIS, in *Mythology*, one of the Parcæ or Fates. Her name is derived from λαχειν, to measure out by lot. She presided over futurity, and was represented as spinning the thread of life, or, according to others, holding the spindle. She generally appeared covered with a garment variegated with stars, and holding spindles in her hand.

LACHISH, in *Ancient Geography*, a city to the southward of the tribe of Judah. Eusebius and St Jerome inform us, that in their time there was a village called Lachish, seven miles southward from Eleutheropolis. Sennacherib besieged Lachish, but did not take it; after which he sent Rabshakeh against Jerusalem. It was at Lachish that King Amaziah was slain by his rebel subjects.

LACHRYMATORY, in *Antiquity*, a vessel in which were collected the tears of a deceased person's friends, and preserved along with the ashes and the urn. Lachrymatories were small glass or earthen bottles, chiefly in the form of phials. At the Roman funerals, the friends of the deceased, or the *præficæ*, women hired for that purpose, used to fill them with their tears, and deposit them carefully with the ashes, in testimony of their sorrow, imagining that the manes of the deceased were thereby comforted and consoled.

LACHSA, Lahsa, or *Hajar*, a division of Arabia, extending along nearly the whole of the south-western coast of the Persian Gulf, from its entrance at Cape Mussendoom, and to a considerable distance inland. Like most other parts of Arabia, the coast is fertile and well peopled; but the interior consists of sandy plains. This country is famed for a breed of asses and camels, and some thousands of the latter are annually exported to Syria. It produces dates, rice, and cotton. The coast from Mussendoom to Bahrein had become such a refuge for pirates, who interrupted by their depredations the trade of the Red Sea, that in 1809 the British government fitted out an expedition at Bombay for the purpose of chastising them. They succeeded in taking by assault Ras-el-Khima, the principal port on this coast, in November 1809, and, burning seventy vessels, carried off considerable plunder. The principal town is Lachsa, situated a few miles up the river Astan, which forms at the mouth a species of bay, opposite to which are the islands of Bahrein, famous for pearls. Long. 48. 34. E. Lat. 26. 56. N.

LACINIUM, in *Ancient Geography*, a noble promontory of the Bruttii, in Italy, the southern boundary of the Sinus Tarentinus and the Adriatic, all to the south of it being deemed the Ionian Sea. It was famous for a rich temple of Juno, surnamed *Lacinia*, with a pillar of solid gold, which Hannibal intended to carry off; but, according to Cicero, was dissuaded by a dream.

LACONIA, or Laconica, a country in the southern part of the Peloponnesus, having Argos and Arcadia on the north, Messenia on the west, the Mediterranean on the south, and the bay of Argos on the east. Its extent from north to south was about fifty miles. It was watered by the river Eurotas. The capital was called Sparta, or Lacedæmon.

LACONIUM, whence our term *laconic*, a short, pithy, sententious speech, such as the Lacedæmonians were remarkable for.

LACQUERS, are varnishes applied upon tin, brass, and other metals, to preserve them from tarnishing, and to improve their colour. The basis of lacquers is a solution of the resinous substance called *seed-lac*, in spirit of wine. The spirit ought to be very strong, in order to dissolve as much as possible of the lac. For this purpose, some authors direct dry potash to be thrown into the spirit. This alkali attracts the water, with which it forms a liquid that subsides distinctly from the spirit at the bottom of the vessel. From this liquid the spirit may be separated by decantation; but by such a process the spirit is impregnated with part of the alkali, which depraves its colour, and communicates a property to the lacquer of imbibing moisture from the air. These inconveniences may, however, be prevented by distilling the spirit; or, if the artist has not an opportunity of performing that process, he may cleanse the spirit in a great measure from the alkali, by adding to it some calcined alum, the acid of which uniting with the alkali remaining in the spirit, forms therewith a vitriolated tartar, which, not being soluble in spirit of wine, falls to the bottom, together with the earth of the decomposed alum. To a pint of the purified spirit, about three ounces of powdered shell-lac are to be added, and the mixture digested during the same day with a moderate heat. The liquor ought then to be poured off, strained, and cleared by settling. This clear liquor is now fit to receive the required colour from certain resinous colouring substances, the principal of which are gamboge and arnotto; the former giving a yellow, and the latter an orange colour. To give a golden colour, two parts of gamboge are added to one of arnotto; but these colouring substances may be separately dissolved in the tincture of lac, and the colour required may be adjusted by mixing the two solutions in different proportions. When silver leaf or tin is to be lacquered, a larger quantity of the colouring materials is requisite than when the lacquer is intended to be laid on brass.

LACTANTIUS, Lucius Coelius Firmianus, an eminent father of the church, at the beginning of the fourth century, was, according to Baronius, an African; but, according to others, was born at Fermo, in the March of Ancona, whence it is imagined he was called *Firmianus.* He studied rhetoric under Arnobius, and was afterwards professor thereof in Africa and Nicomedia, where he was so much admired that the Emperor Constantine chose him as preceptor to his son Crispus Cæsar. Lactantius was so far from seeking the pleasures and riches of a court, that he lived there in poverty, and, according to Eusebius, frequently wanted the necessaries of life. He is justly accounted the most eloquent of all the ecclesiastical authors who have written in the Latin language. He formed himself upon Cicero as a model, and wrote in a style so remarkable for its purity, natural grace, and smoothness, that he is generally distinguished by the denomination of the Christian Cicero. Several works of his are still extant, the principal of which are, 1. his *Institutiones Divinæ*, a treatise in seven books, of which he made an abridgment, adding thereto another tract, *De Ira Divina;* 2. *De Asseribus Dei*, in which he treats of the creation of man, and of divine providence; 3. Two books to Æscepiades, eight books of letters, a poem in hexameter verse, a treatise entitled The Grammarian, and another *De Persecutione.* It is also believed that the treatise *De Mortibus Persecutorum* was written by Lactantius. Some works, however, have been erroneously attributed to this father of the church. Amongst these may be mentioned the Phœnix, which is the production of a Pagan, not of a Christian; the poem upon Easter; that on the Passion of Christ; the Arguments upon the Metamorphoses of Ovid; and the Notes upon the Thebaid of Statius. Of the two last productions, the real author was Lactantius Placidius the grammarian. The prominent characteristic of Lactantius as a Christian writer is, that he exposes the illusions of Paganism with great force of reasoning. But he treats theology more like a philosopher than a divine. He did not thoroughly understand the nature of the Christian mysteries, nor distinguish between the respective provinces of faith and of reason; and hence he was betrayed into some errors, of which advantage has been taken by persons who either knew not, or chose to make no allowance for, the circumstances in which they originated. The best edition of his works is that published at Paris in 1748, in two vols. 4to.

LACTHO, a province of India beyond the Ganges, tributary to the sovereign of Cochin-China. It is bounded on the south by Lars, on the north and east by Tungquin, and on the west by China. This territory has been but imperfectly explored by Europeans; but it is described by the Tungquinese as mountainous, rocky, covered with jungle, and destitute of navigable rivers, with a singularly pestilential air, and water very unwholsome, though the climate is cooler than that of Tungquin. The interior is inhabited by numerous tribes, little better than savage, governed by hereditary chiefs, and perpetually at war with each other. Salt is imported into this country from Tungquin; also salt-fish, oil, and some silk stuffs for the chiefs. The exports to Tungquin are chiefly buffaloes and cotton. Shells and cowries form the medium of exchange. According to information derived from the Tungquinese, this province contains many extraordinary natural caverns, which appear to have served the natives as temples. One cavern is described as a mile across, perforating a mountain, and another as being entered under ground in a boat.

LACTIFEROUS, an appellation given to plants abounding with a milky juice, as the sow-thistle and various others. The name of *lactiferous*, or *lactescent*, is given to all those plants which abound with a thick, coloured juice, whatever may be its colour. Most lactiferous plants are poisonous, except those with compound flowers, which are generally of an innocent quality. Of the poisonous lactescent plants, the most remarkable are sumach, agaric, maple, burning thorny plant, cassada, celandine, puccoon, prickly poppy, and the plants of the natural order *contortæ*, as swallow-wort, apocynum, cynanchum, and cerbera. The bell-shaped flowers are partly noxious, as cardinal flower; partly innocent, as campanula. Amongst the lactescent plants with compound flowers that are innocent in their quality, may be mentioned dandelion, picris, hyoseris, wild lettuce, gum succory, hawkweed, bastard hawkweed, hypochœris, goat's beard, and most species of lettuce.

LACUNAR, in *Architecture*, an arched roof or ceiling, more especially the planking or flooring above porticos or piazzas.

LACYDES was born at Cyrene, a city on the northern coast of Africa. Of his personal history we are able to collect a few facts from Suidas and Diogenes Laertius. He was the son of a certain Alexander, of whom we know nothing except the name, and that his poverty exposed his son to many hardships. The love of learning drew Lacydes to Athens at the time when Arcesilaus had become the founder of what has been called the Middle Academy. He became the pupil of Arcesilaus, and by his acuteness and varied acquirements soon procured for himself the friendship of his instructor. On the death of Arcesilaus he succeeded to the vacant chair, B. C. 241, and presided in the academy for twenty-six years; at the end of which he abdicated, B. C. 215, in favour of two of his disciples, Evander and Telechus. Laertius asserts that he deserted the tenets of Arcesilaus; but Cicero (*Acad.* iv. 6) states that he continued to teach the same doctrines as his predecessor. He taught that there was no certainty in philosophical knowledge; and that in all purely speculative subjects we must refrain from coming to a decision, because the mind of man cannot sufficiently distinguish truth from falsehood. He does not, however, appear to have carried these sceptical opinions into the every-day affairs of life, but to have restricted them to philosophy and science; though his opponents asserted, and with much reason, that such doctrines as he advocated tended to undermine all virtue and morality. Lacydes was the friend of Attalus king of Pergamus, and was invited by him to take up his residence at his court; but he answered, that philosophers admired the portraits of kings most at a distance. The latter part of his life was spent, if we can credit the statements handed down to us, very differently from his early years. He gave himself up to every kind of debauchery, and his passion for wine replaced the taste for study. Athenæus (x. 10) states that he was the greatest wine-bibber of his age, and often came off victorious in contests of that kind. He at last died in consequence of one of his excesses.

LADDER, a frame made with a number of steps, by means of which people ascend, as by a stair, to places otherwise inaccessible.

Scaling Ladders, in the military art, are used in scaling when a place is to be taken by surprise or escalade.

LADEN, in nautical language, the state of a ship when she is charged with a weight or quantity of any sort of merchandise, or other materials, equal to her tonnage or burden. If the cargo with which she is laden be extremely heavy, her burden is determined by the weight of the goods; if it be light, she carries as much as she can stow, that she may be fit for the purposes of navigation. As a ton in measure is generally estimated at 2000 lbs. in weight, a vessel of two hundred tons ought accordingly to carry a weight equal to 400,000 lbs. when the matter of which the cargo is composed is specifically heavier than the water in which she floats; or, in other words, when the cargo is so heavy that she cannot float high enough with so great a quantity of it as her hold will contain.

Laden in Bulk, the state of being freighted with a cargo which is neither in casks, boxes, bales, nor cases, but lies loose in the hold, being defended from the moisture or wet of the hold by a number of mats and a quantity of dunage. Such are usually the cargoes of corn, salt, or such materials.

LADERNOJE-POLE, a circle in the Russian province of Olonez, extending over 660 square miles. It is so woody, marshy, and cold, that a small part only of it is capable of cultivation, and it contains not more than 23,500 inhabitants. The capital is the town of the same name situated on the river Swir. Near to it, Peter the Great formed his establishment for building his fleets. It is now a small place, with few and poor inhabitants. Long. 34. 23. E. Lat. 60. 45. N. It is about 170 miles from St Petersburg.

LADIK, or Ladikieh, a town of Asia Minor, which occupies the site of the ancient Laodicea. The only vestiges that remain of this ancient place are fragments of marble columns, and a few capitals and pedestals of pillars, which the Turks have converted into tomb-stones. The modern town is built of mud, and contains 400 or 500 inhabitants. It is thirty miles west of Konieh.

LADISLAUS, the names of several kings of Poland. See Poland.

LADOGA, a lake in Russia, situated between the gulfs of Onega and Finland, measuring 150 miles by ninety, and considered as the largest in Europe. Peter the Great cut a canal sixty-seven miles in length from the south-western extremity of the lake, thus opening a communication between it and the Gulf of Finland.

LADOS Isles, a group of high, rugged, small islands, running in ridges from the mountains to the sea, with beautiful intervening valleys. They are situated off the north-west coast of the Malay peninsula. Long. 99. 40. E. Lat. 6. 5. N.

LADRONES, or Mariana Islands, a cluster of small islands in the North Pacific Ocean, off the southern extremity of China, and stretching 450 miles from north to south. These islands are fourteen, or, according to others, sixteen in number; namely, Guam or St John, the largest, Zarpane or Rota, Aguignan or St Ann, Tinian, Saypan or St Joseph, Anatachan or St Joachim, Sarigan or St Charles, Guguam or St Philip, Amalagan or Conception Isle, Pagon or St Ignatius, Agrigan or St Xavier, Assonsong or Assumption Island, and Urac, a desert isle. With the adjacent islands, the Ladrones are so near to the continent that they appear like disjointed fragments from the mainland. The islands to the eastward of the great Ladrone are high and uneven, and the depth of water amongst them is about twenty fathoms. Those to the westward are of a more even surface, and appear like a continued land, and the water amongst them is shoaler. These islands have a very barren and unpromising aspect, having scattered patches of verdure in particular spots, but their general appearance being little better than naked rocks, with scarcely a tree or shrub visible. These islands have been celebrated by the author of Anson's Voyage, as little short of a terrestrial paradise. It was in 1742 that Anson's wearied crew landed on them, wasted with sickness and a long sea-voyage, and naturally delighted with the appearance of land in any form; and these islands were, besides, at that time in a state of cultivation. Having since been neglected, they are now overrun with the rank vegetations of a tropical climate; and when the island was visited by subsequent navigators, amongst others by Byron, it was found to be an uninhabitable wilderness, overgrown with impenetrable thickets. The reason of this change was, that, owing to the oppressive policy of the Spaniards, by whom these islands had been conquered, the inhabitants, some time previous to Anson's visit, had been removed to another island, and had left behind them, in the improved state of the country, proofs of their industry and civilization. Cotton and indigo trees abound, and generally all the productions of the tropical climates. Wild hogs are abundant, and of a very large size. The inhabitants are tall in their persons, and very active and robust; they are rude in their habits, and follow blindly the ignorant superstition of their priests, who instruct them in the belief of a malignant spirit, whom they appease by certain ceremonies. Long. of the Great Ladrone, 113. 44. E. Lat. 21. 52. N.

LADY, a title derived from two Saxon words, signifying *loaf-day*, words which have in time been contracted into the present appellation. It properly belongs only to the daughters of earls, and all of higher rank; but custom has made it a word of complaisance for the wives of all gentlemen. As to the original application of this expression, it may be observed, that in former times it was the fashion for opulent families to live constantly at their mansion-houses in the country, where once a week, or oftener, the lady of the manor distributed to her poor neighbours, with her own hands, a certain quantity of bread.

Lady-Day, in *Law*, the 25th of March, being the annunciation of the Holy Virgin.

LAERNE, a town of the Netherlands, in the province of East Flanders, and arrondissement of Oudenarde, containing 530 houses, and 3300 inhabitants.

LÆLIUS Sapiens, C., was the son of C. Lælius Nepos, and distinguished by his love of philosophy in an age when war still continued to be regarded as the only employment worthy of a Roman. He was the pupil of Diogenes the stoic, and afterwards of Panætius. (Cic. *Fin.* ii. 8.) He was the intimate friend and companion of Scipio Africanus the younger, and attended him in his expedition into Africa when he took Carthage, B. C. 146. (Appian. *Pun.* 126.) He was then employed as prætor in Lusitania, where he obtained considerable advantages over Viriathus. (Cic. *Off.* ii. 11.) He was elected consul along with Servilius Cæpio (B. C. 140); but notwithstanding the able manner in which he discharged the duties of the office, he did not succeed in being re-elected, a circumstance which Cicero laments in most feeling language. (*Tusc.* v. 19.) Lælius spent much of his time in the country, devoting himself partly to rural occupations, and partly to study. The mildness of his disposition, and the equanimity of his temper, are noticed by Horace, when he speaks of *mitis sapientia Lælii.* (*Sat.* ii. 1.) He was the intimate friend of Pacuvius and Terence; and it is said that he and Scipio assisted the latter in the composition of some of his plays. It was no doubt his friendship with Scipio that induced Cicero to place the name of Lælius at the head of his beautiful essay on Friendship. The interlocutors are Lælius himself, and his two sons-in law, C. Fannius and Q. Mucius Scævola.

LÆNA, in *Antiquity*, was a gown worn by the Roman augurs, and peculiar to their office. In this gown they covered their heads when they made their observation on the flight of birds, and other omens.

LÆSTRYGONES, the most ancient inhabitants of Sicily. Some suppose them to be the same as the people of Leontium, and to have been neighbours to the Cyclops. They fed on human flesh; and when Ulysses landed on their coasts, they sunk his ships and devoured his companions. According to Homer's description, they were of a gigantic stature. A colony of them is supposed to have passed over into Italy with Lamus at their head, where they built the town of Formiæ; and hence the epithet of *Læstrygonia* is often used for that of *Formiana.*

LÆVIUS, a Latin poet, whose age is unknown, but who probably lived before the age of Cicero. A poem of his, entitled *Erotopagnia*, or Love-Games, is quoted by Aulus Gellius. Apuleius also quotes six lines from the same poet, but he does not state from what work he borrowed them. Lævius had also composed a poem entitled the Centaurs, which Festus quotes under the title of *Petrarum.*

LAGEMAN (*Lagammannus*) *homo habens legem*, or *homo legalis seu legitimus*, or, as we now say, "good men of the jury." The word is frequently used in Domesday, and the laws of Edward the Confessor.

LAGEN (*Lagena*), in ancient time, was a measure of wine, containing six sextarii, and from which is probably derived our *flagon.* Sir Peter Leicester, in his *Antiquities of Cheshire*, interprets *lagena vini* to mean a bottle of wine.

LAGONEGRO, a city, the capital of a district of the same name, in the province of Basilicata, of the kingdom of Naples. It is situated in the valley of Sorgipiano, on the banks of the river of that name, in a fertile and beautiful spot, filled with villas. The population is 5150.

LAGOS, a city of Portugal, the capital of the province of Algarve. It is a seaport, in a bay of the same name, celebrated for the naval victory obtained in it by Admiral Rodney over the Spanish fleet commanded by Don Juan de Langara, in the American war. The vicinity of Lagos is very mountainous, and abounds with woods, which are converted into charcoal, with which fuel it supplies a great portion of the south of Spain and Portugal. It is fortified and well built, has two parish churches, three monasteries, two hospitals, one alms-house, 801 houses, and 4050 inhabitants. A small harbour, guarded by two forts, is good, and can contain a whole fleet. It trades in wine, oil, figs, and corn, and has sumptuous aqueducts.

LAGRANGE, Joseph Louis, a mathematician and astronomer of the first rank, born at Turin on the 25th of January 1736, was the son of Joseph Louis Lagrange, treasurer at war, and Maria Theresa Gros, only daughter of a rich physician at Cambiano.

He was the eldest of eleven children, but nine of them died young. His family was of French extraction on both sides; and his French biographers have dwelt with pleasure on the minute particulars of their emigration, in order the more fully to authenticate their own claim to the honour of calling him their natural as well as adopted countryman. It was his great grandfather that first settled at Turin, in the service of Emmanuel II., who married him to a Roman lady of the family of Conti. They had at one time acquired considerable affluence, but his father had ruined himself by his expenses and speculations; and Lagrange used frequently to observe, that he owed his own success in life to his father's misfortunes, since, if he had been rich, he should never have applied to the mathematics as a profession. The classics were at first his favourite study at the college of Turin; he began his scientific education with reading the works of the ancient geometricians, and at first preferred their methods of investigation to the more modern analysis; but being convinced, as it is said, by a paper of Halley in the *Philosophical Transactions*, of the superiority of the algebraical mode of representation, he applied with redoubled ardour, at the age of seventeen, to the study of the later improvements in the methods of investigation; and in his subsequent works he abandoned, wherever it was practicable, all geometrical considerations, and seems to have valued himself on having produced a complete system of mechanics, free from the incumbrance of any diagram whatever. When he was only nineteen, he was made professor of geometry in the Royal School of Artillery, but not before he had exhibited, in his first publication, a specimen of the improvements which he was throughout his life to contribute to the mathematical sciences.

The friendships which he formed with his pupils, most of whom were his seniors, led to the establishment of a society which afterwards received the sanction of the royal authority, and to the publication of their memoirs, in which Lagrange not only took the most active part as a contributor of original papers, but also by materially assisting in the demonstrations of Foncenex, and promoting the researches of Cigna and Saluces. Foncenex was soon rewarded by being placed at the head of the maritime establishment which the king was then forming; and Lagrange received in a short time a still more flattering remuneration, in the panegyrics which were liberally bestowed on him by his great rivals Euler and D'Alembert; the former procured him, in 1759, the compliment of being made a foreign member of the Academy of Berlin, having become well acquainted with his merits by an epistolary intercourse, which began as early as the year 1754, when Lagrange communicated to him his first ideas of the solution of isoperimetrical problems, which Euler had the delicacy to allow him time to complete, before the publication of his own further researches on the subject.

In 1764 he obtained a prize from the Academy of Sciences at Paris, for a memoir on the difficult subject of the libration of the moon, having treated it by an original method, derived from the principle of virtual velocities, which he afterwards applied so successfully to other branches of mechanics. Soon after this time he found an agreeable relief from the monotony and retirement of his life at Turin, in accompanying his friend the Marquis Caraccioli, who was appointed ambassador at the court of London, as far as Paris, where he had the delight of becoming personally acquainted with a number of the most distinguished mathematicians of the age, who were capable of appreciating his merits, especially with Clairaut, D'Alembert, Condorcet, Fontaine, Nollet, and the Abbé Marie; but indisposition prevented his going on to England, as he had intended, and he returned to Turin after a short stay in France. A second prize, on the subject of the satellites of Jupiter, was awarded him in 1766; and the same tribute was again paid to his merit on three subsequent occasions. It was in this year that he was invited to Berlin, as a successor to

Euler in the place of mathematical director of the academy, Euler having been induced to remove to Petersburg, by a better prospect of providing for his numerous family. The appointment of president of the academy, held by Maupertuis, had been given but in part to Euler; the whole was offered to D'Alembert, who declined it; but both he and Euler united in recommending Lagrange as the fittest person for the situation. It was, however, with some difficulty that he obtained his sovereign's leave to quit Turin; and the favour was at last granted to him partly in pique, on account of the terms of the invitation, which expressed the desire of the "greatest king in Europe" to have the greatest mathematician at his court.

At Berlin he pursued his career of study in tranquillity and without interruption, upon a competent income of about L.300 a year, with the advantage of such demonstrations of the royal protection as were still more important than income to his rank in society. The king seems to have preferred him to Euler, as more tolerant in his opinions, though by no means joining in all the innovations of the day, and rather avoiding every discussion relating to them, as well as any great familiarity with his patron. He was made, in 1772, one of the eight foreign associates of the Parisian Academy. He is said to have married more for the sake of complying with the universal custom of his friends and colleagues at Berlin, than for any desire of female society; and he invited a relation of his own from Turin, who became his first wife; but she was soon after carried off by a lingering disease. He was about this time very closely employed on his greatest and best work, the *Mécanique Analytique*; but it was with some difficulty that the Abbé Marie found a bookseller at Paris, who agreed to undertake its publication, and only upon condition of engaging himself to divide the loss, in case of failure in the sale. He also procured the valuable assistance of Mr Legendre as a corrector of the press.

Upon the death of Frederic in 1786, Lagrange no longer felt the same interest in remaining at Berlin, though he was not treated by the new court with any thing like disrespect. While the ministers of Naples, Sardinia, and Tuscany, were making him offers on behalf of their respective sovereigns, Mirabeau persuaded the French ambassador at Berlin to recommend Mr de Vergennes to invite him to Paris; but it was in reality through Mr de Breteuil's interest, and at the suggestion of the Abbé Marie, that he was ultimately induced to settle there in 1787, having received a grant of an income equal to that which he had enjoyed at Berlin, under the name of a veteran pensioner of the academy, with a vote in its deliberations. He was kindly received by Marie Antoinette, on account of his connection with Germany; and, until the Revolution, he had the use of apartments in the Louvre.

It was at this period of his life, when his success had been the most gratifying, and his fame had become perfectly established, that he appeared to suffer under a degree of melancholy or apathy, which was absolutely morbid. He confessed that all his enthusiasm was extinguished, and that he no longer felt the least relish for mathematical researches. He had not even the curiosity for two years to open the printed volume of his *Mechanics*, which he had never seen except in manuscript. It is a consolation to think, that this annihilation of his energies was only partial and temporary. He amused himself in the mean time with metaphysics, "with the history of religions" and of languages, and with medical and botanical, and especially chemical studies; and the alarms and agitations of the Revolution, which soon followed, instead of overwhelming his broken spirit, seem to have roused his dormant powers, and to have revived his satisfied ambition, exciting him to new labours and new triumphs.

In 1791 his name appeared on the list of the foreign members of the Royal Society of London. Mr Maurice has asserted, that all the scientific bodies of Europe, *except* the Royal Society, received him with open arms; if the remark was intended as a censure of that society, it is right that its injustice should not pass unnoticed.

Notwithstanding the public embarrassments which attended the Revolution, Lagrange's pension was confirmed by the National Assembly, upon the proposition of Mr Duséjour, in the most flattering manner; and when the depreciation of the currency materially reduced its amount, he received a partial indemnification, by being appointed a member of a committee for examining useful inventions, and afterwards a director of the mint, in conjunction with Berthollet and Mongez; but this employment he found too laborious, and resigned it six months afterwards. He was greatly interested at this period in the establishment of the new system of weights and measures; he was so violently bent on *decimation*, that he scarcely forgave Borda for having made a measure of a quarter of a metre; and he thought so little of the advantage of integral subdivisions, that he sometimes declared he should have preferred the number eleven to twelve, for the very reason that it admitted no subdivision at all, and caused all lesser quantities to be expressed in units comparable to each other only. This opinion seems, however, to have been advanced rather as an exaggerated objection to the introduction of twelve, which was suggested by some more ardent innovators, than as seriously attributing a real advantage to the employment of a prime number.

When the academies were suppressed, the Jacobins purified the commission of weights and measures by striking out the names of many of its most distinguished members, while they retained that of Lagrange, probably because he was of no political party whatever, and had always been particularly cautious in expressing his sentiments of the events of the day. In October 1793, however, a decree was passed, which ordered all persons not born in France to leave the country. Guyton, who was a member of the committee of public safety, advised him to claim an exemption from its operation, by a requisition of that committee, on the pretext of his being employed in preparing a report on Dr Hutton's *Treatise on Gunnery*; and he actually received an injunction from the committee, requiring his stay, "in order to complete the calculations which he had undertaken respecting the theory of projectiles." He was attempting to reunite the experiments of Dr Hutton with a more correct theory than had before been applied to them; but he published nothing of importance on the subject. After the murder of Bailly and Lavoisier, he had agreed to return to Berlin, and to resume his former situation there; and he was on the point of obtaining a passport, and even a public mission from Hérault de Sechelles. But the establishment, first of the *Normal School*, in which he was a professor, and then of the *Ecole Polytechnique*, induced him to remain at Paris, and again directed his activity into its ancient channels. In the Normal Schools the masters were mixed with their pupils, in order that the facilities of conversation might produce a development of the subjects discussed in the most elementary manner that was possible; but the conversation was by no means supported in the form of incessant questions and answers; Lagrange's explanations were often interrupted by moments of silence, in which his inventive faculties were deeply engaged in reflection, and the whole of his powers were concentrated on a new train of ideas. It was amidst these discussions that the *Theory of Analytical Functions* originated, a work certainly not destitute of the marks of great mathematical talent, but which, when considered as a substitute for the method of fluxions and its kindred doctrines, resembles very much the suggested introduction of an undecimal in preference to a duodecimal scale of notation, with which the author had before amused himself.

Upon the re-establishment of the Institute, Lagrange was made one of the original members; and he was the first on the list of the Board of Longitude, which was then first instituted at Paris. He received about this time a compliment highly grateful both to his love of fame and to his filial affection, in the person of his father, then past ninety, and continuing to reside at Turin. By the direction of Talleyrand, who was minister for foreign affairs, the commissary of the directory of Piedmont, attended by the generals of the French army, and several other persons of distinction, went in procession to congratulate this venerable person on the merits of his son, whom he had not seen for more than thirty years, whom they declared "to have done honour to mankind by the brilliancy of his genius, and whom Piedmont was proud to have produced, and France to possess as a citizen." The old man lived to the age of ninety-five, and was sincerely regretted by his son.

Under the consular and imperial government, Lagrange was made a senator, a grand officer of the legion of honour, a count of the empire, and a knight grand cross of the order of reunion, in addition to the personal marks of friendship and intimacy which Bonaparte habitually conferred upon him at the meetings of the Institute, and on other occasions.

He applied with so much zeal to the republication of the first part of his *Mechanics* in 1811, and of his *Analytical Functions* in 1813, that his health is supposed to have suffered from the fatigue; which, in conjunction with a predisposition, not uncommon in advanced life, may very possibly have been the immediate cause of a fit that attacked him in the beginning of the latter year. In the month of March he was subject to frequent returns of fainting, accompanied by some fever. On the 8th of April he had a last conversation with Lacépède, Monge, and Chaptal, all the parties being aware that it was to be the last. He felt the approach of death, but he declared that it was in that form neither painful nor even disagreeable. He spoke with proper gratitude of the favours he had received from Bonaparte, who afterwards provided very liberally for his widow and his brother. The interview lasted more than two hours; and though his memory often failed him with respect to names and dates, yet his language was correct and energetic. He survived this effort only two days, and died on the morning of the 10th April 1813. He was buried at the Pantheon, or the church of St Géneviève, and his friends Lacépède and Laplace paid the last honours to his memory in a funeral oration.

Lagrange was habitually of delicate health, and extremely temperate in his diet and mode of life, limiting his food almost entirely to vegetables, and taking his exercise very punctually in the open air. At the age of fifty-six he married the young and handsome Miss Lemonnier, who appears to have felt the splendour of his celebrity and the goodness of his heart, as affording much more than a compensation for the great inequality of their ages. He was deeply sensible of her affectionate attachment, which he considered as the greatest happiness of his life, and on account of which alone he regretted its termination. He had no children, and he was perfectly contented to be without them. In the midst of the most brilliant societies he was generally absorbed in his own reflections; and especially when there was music, in which he delighted, not so much for any exquisite pleasure that he received from it, as because, after the first three or four bars, it regularly lulled him into a train of abstract thought, and he heard no more of the performance, except as a sort of accompaniment assisting the march of his most difficult investigations, which he thus pursued with comfort and convenience. He was less fond of the theatre, from which he often returned without knowing what piece had been represented. His manner in conversation was gentle and timid; he was more in the habit of interrogating than of giving his opinion, and his favourite expression was, "I don't know" .... He was not, however, easily induced to change his sentiments when they were once fixed, having generally adopted them upon mature consideration. As a writer, whenever any controversy occurred, he was always calm in defending himself, and respectful in speaking of his antagonists. Notwithstanding that his person was striking and characteristic as well as pleasing, he would never consent to have his portrait painted, thinking it unworthy of a man of intellectual excellence to wish to be remembered for the external form of his features. But a sketch of him was once obtained by stealth at a sitting of the Institute, and a mask of his face was taken after his death. His works bear witness, that for fifty-four years he occupied either the first or very nearly the first place among all the mathematicians of his age, and of all ages. "Of all the inventors," says Laplace, "who have the most contributed to the advancement of human knowledge, Newton and Lagrange appear to me to have possessed in the highest degree that happy tact, which enabled them to distinguish general principles among a multitude of objects enveloping them, and which is the true characteristic of scientific genius. This tact, in Lagrange, was united with a singular elegance in the method of explaining the foundations of the most abstract truths of analysis." Lagrange was a great admirer of Euler, who perhaps excelled him in the adroitness with which he employed the most refined artifices of calculation, though his views and methods were less original and less powerful. D'Alembert was highly esteemed by Lagrange, as a man of abundant ingenuity and talent, though less accurate in his conclusions, and in his modes of reasoning, than either Euler or Newton. Newton he envied almost as much as he admired, for having found a system of the world in existence, and the principles of its modification not yet understood; but when it is remembered that the places of the heavenly bodies are now ascertained to seconds more nearly than they were to minutes during the life of Newton, it cannot be thought that Newton left too little for his successors to accomplish.

1. His first publication, at the age of eighteen, was a Letter to C. J. Fagnano, 23d June 1754. It contains series for fluxions and fluents of different orders, somewhat resembling the binomial theorem of Newton.

2. The series of his papers in the *Miscellanies of Turin* is continued from 1759 to 1785. The first is on Maxima and Minima, *Misc. Taur.* i. 1759, p. 18. It is founded on the principles laid down by Maclaurin, and is illustrated by the case of the successive transmission of an impulse through a series of elastic bodies, comprehending the combination of a number of variable quantities. 3. On an Equation of Finite Differences, and on the Theory of recurring Series, p. 33. The equation is resolved by an exponential integral, and the sum of the series is obtained by the principles of fluxions; the same mode of calculation is also applied to the laws of chance. 4. Researches on the Nature and Propagation of Sound: end of the volume. The investigations of Taylor and of Newton were true and correct as particular solutions only of the problems of chords and of undulations, though mistaken for general solutions, and as such successfully combated by Cramer, whose reasoning, though certainly too far extended, is here approved by Lagrange. Daniel Bernoulli very successfully defended them both, not only as particular solutions, but as capable of being rendered universal by proper modifications and combinations. Eu-

ler had proposed a more general construction for the case of chords; D'Alembert insisted that this method required a limitation to figures exempt from angles and from abrupt changes of curvature, and Lagrange is inclined to admit his exceptions. But, after all, the question is merely a metaphysical refinement, since no abrupt changes can ever occur in the actual form of a chord; and a chord affording a harmonic of unlimited acuteness will approach without limit to a mathematical angle. The author begins, in this essay, with considering the motions of a finite number of bodies, and then proceeds to the affections of a fluid, which he reduces to the same equations as are applicable to the motions of chords, and these he integrates in D'Alembert's manner. He lastly examines the phenomena of the grave harmonics observed by Tartini, and explains them very satisfactorily from the analogy of the beats of discordant sounds. 5. New Researches on Sound, *Misc. Taur.* ii. 1760–1, p. 11. The same subject is here continued, and extended to the divergence of sound, which had before been examined by Euler. The author now admits that there is no inconsistency in the demonstration of Newton and Cramer, which deduce the same velocity from different laws of the supposed motion, since the velocity is really uniform in all cases. The oscillations of a heavy chain are computed, and some remarks are made in conclusion respecting the sounds of flutes. 6. On the Maxima and Minima of Indefinite Integrals, p. 173. This essay contains the foundation of the method of independent variations, which has excited so much attention, for the universality of its application and the utility of its results. It was received with distinguished applause by Euler, as fulfilling his own wishes for the extension of a similar method; and it was Euler who more fully explained its principles, and gave it the name of the method of variations, which has since been generally applied to it. In fact, however, the foundation of the method had long before been laid by Leibnitz, under the name of differentiation from curve to curve; and he had proved that the process of integration, with respect to one kind of variation, might be applied to the differentials or fluxions taken in another manner, without the necessity of first obtaining the fluent; and Euler had employed this consideration in treating of the geometrical properties of curves affording maxima or minima; but his method is less simple and less general than that of Lagrange, who first pointed out the universality of the principle, that the variation of the fluxion is equal to the fluxion of the variation, and showed its utility in many cases of such integrations, as leave the expression concerned still a fluxion of another kind; and in the mechanical application of the method, he made the fluxion of the ordinate of a vibrating chord represent its inclination to the axis at any given time, whilst its variation indicated its velocity or its change of place in successive intervals of time, and the fluxion of a revolving solid to relate to the magnitude of its different parts, whilst its variation depended on its rotatory velocity. The steps of the method are generally simple and easily understood, at least they may and ought to be rendered so; but the merit of the invention is not the less because it admits of a very ready application, and because it might have occurred to a less distinguished mathematician; as indeed something nearly resembling it seems to have been employed by Fontaine in 1734, under the name of the fluxiodifferential calculus, in the investigation of a tautochronous curve. 7. It was particularly in demonstrating the law which is called the law of the least action, that Lagrange completed the theory of variations, where Euler had felt its deficiency; and the Application of the Method to several Mechanical Problems constitutes the second part of the Memoir, p. 106. The author takes occasion also to correct an error of D'Alembert, who had imagined that there was no necessity that the different strata of a given density, in a body like the earth, supposed to be in a state of fluidity, should all be level, which, however, is here shown to be a necessary consequence of D'Alembert's own equations. 8. Addition to the Memoir on Sound, p. 323; admitting the difficulty raised by D'Alembert respecting the continuity of the figure of a chord, and acknowledging that the initial figure must not be supposed angular; while, in fact, as Mr Fourier has lately demonstrated, and as had been remarked many years ago in this country, an infinite series of harmonic curves may approach infinitely near to two right lines meeting in an angle. 9. Problems relating to the Integral Calculus, *Misc. Taur.* iii. 1762–5, p. 179: a miscellaneous paper, containing remarks on the resolution of equations, containing fluxions of different orders; on some cases of the motions of fluids; on the vibrations of chords; on the properties of small oscillations in general; on loaded threads; on central forces; and on the theory of Jupiter and Saturn. 10. An Arithmetical Problem, *Misc. Taur.* iv. 1766–9, p. 44. This paper, dated at Berlin, contains a complete resolution of all equations of the second degree, having whole numbers for their roots; a problem, like most of those of Fermat, of more curiosity than utility, but well calculated to exercise the powers of minds like those of Euler, Lagrange, Legendre, and Gauss. The question which is the particular subject of this paper was proposed as a challenge by Fermat to his contemporaries in England, and correctly answered by Wallis, though without a very satisfactory demonstration. 11. Integration of an Equation, p. 98: a case in which the whole equation is integrable, though its parts, even when properly separated, are incapable of perfect integration. 12. On the method of variations, p. 163: in answer to Fontaine, and to Le Seur and Jacquier, who had attacked him in their integral Calculus. 13. On the Motion of a Body attracted by two fixed Centres, p. 188–216, including the effects of different supposed laws of attraction. 14. On the Figure of Columns, p. 123. This memoir contains an attempt to demonstrate that the cone is a more advantageous figure for the strength of a column than any conoid, and the cylinder than any cone. But the calculations are founded on the erroneous supposition that the column must bend before it breaks; and, even upon this hypothesis, it appears possible to assign a stronger form than a cylinder, since the summit and the base of the cylinder must certainly contain some useless matter. 15. On the Mean of a number of Observations, p. 167; showing the advantage of taking the mean from the theory of probabilities. 16. On the Impulse of Fluids, *Mém. Taur.* 1784–5, i. p. 75. The author observes, that this impulse will be measured by a column of twice the height due to the velocity when the whole impulse of the jet is received by an obstacle, but of the simple height when a limited surface is exposed to the force of a larger stream. 17. On the Integration of some irrational Fluxions, ii. p. 218; involving the square root of an expression ascending to the fourth power of the variable quantity.

18. Some of the later of these papers are subsequent in date to those which are found in the *Memoirs of the Academy of Berlin*; but the order of enumeration is of little consequence. The first communication of Lagrange to the academy, of which he was made director, is on Tautochronous Curves, *Mém. Berl.* 1765, p. 364. The paper is dated 1767; and it contains a completion of Fontaine's investigation of the subject. 19. On the expected Transit of Venus, 1766, p. 265. The author has here analytically investigated the curves of immersion and emersion for the different parts of the earth. But, as Mr Delambre observes, in order to arrive at the very easy and tolerably accurate solution previously given by Delille and Lalande,

he is obliged to employ in succession several elaborate expedients, founded on some very subtile principles, accompanied by various transformations of his ordinates, while, by a trigonometrical calculation of a few lines, we may obtain a more complete formula, comprehending even the terms which he has neglected, and which, although very small, are not absolutely insensible. At the same time, he has certainly applied his formula to the calculation of the parallax of the sun in a very convenient manner, which had accidentally escaped both Delille and Lalande, though it follows readily from the trigonometrical calculation. 20. On Indeterminate Problems of the Second Degree, 1767, p. 165. This is the first of a numerous series of papers relating to this difficult branch of analysis, which, notwithstanding its perfect inutility, has afforded sufficient scope for the exertion of talent, to give celebrity to the names of Diophantus and Fermat among the most ingenious of mathematicians. 21. On Numerical Equations, p. 311. This subject was also much cultivated by the author at a subsequent period: he here finds an equation for the differences of the roots, and exhibits the result in the form of a continued fraction. 22. Continuation of the Memoir on Numerical Equations, 1768, p. 111. The method of continued fractions is still further improved. 23. On the Resolution of Indeterminate Problems in whole Numbers, p. 181. 24. On the Resolution of Literal Equations by Series, p. 251. The contents of these memoirs have been principally merged in the author's later productions. 25. On the Force of Springs, 1769, p. 167. It is demonstrated in this interesting paper, that the force of a hair-spring approaches to the law of a circular pendulum, the more nearly as its length is greater. 26. On Kepler's Problem, p. 204: an application of the methods explained in the last volume, especially of a very elegant formula for the reversion of series. 27. On Elimination, p. 303: a refined and general method of exterminating a quantity from an equation, which, however, is somewhat intricate, even in the simplest cases. 28. Remarks on Isochronous Curves, 1770, p. 97: chiefly in answer to Fontaine, who had attacked him, and who had claimed the invention of the test of integrability of an expression containing several variable quantities. Lagrange observes, that he might very possibly have rediscovered it, but that it was published by Nicolas Bernoulli in 1720; by Fontaine not till 1738. 29. On Arithmetical Theorems, p. 123; relating to the decomposition of a number into squares. 30. On the Resolution of Equations, p. 134. 31. On a Theorem respecting Prime Numbers, 1771, p. 125. A demonstration of the property of prime numbers discovered by Mr Wilson, and published by Waring; and of some other theorems of Waring. 32. On Equations, p. 138: in continuation. 33. On a New Mode of Differentiation and Integration, 1772, p. 185. The novelty consists in considering the characteristic of a fluxion as a quantity multiplying the letter to which it is prefixed, and inferring by induction that the result of the combinations obtained will in general remain unaltered by the supposition. The grounds of this method have been of late more fully explained by Arbogast and others. The results are here applied to interpolations, and to differences of various orders. 34. On the Form of Imaginary Roots, p. 222: in general reducible to $A + \sqrt{-1}\,B$. 35. On Astronomical Refractions, p. 259: without any practical applications. 36. On Equations of Partial Differences, p. 353; especially on finding multipliers to make them integrable. 37. On undisturbed Rotation, 1773, p. 85: a more direct method of investigation than that of Euler or D'Alembert, but without any new results. 38. On the Attraction of Elliptic Spheroids, p. 121. The author observes, that Maclaurin's prize essay is a masterpiece of geometry, comparable to the best works of Archimedes, though D'Alembert had once doubted of the accuracy of some of his propositions. Thomas Simpson's was the first analytical solution of the problem, but it was indirect, and depending on series only. In this paper the method of demonstration only is varied. Legendre and Laplace subsequently continued the inquiry. "But Mr Ivory," says Delambre, "has lately shown us that a very simple consideration may in some cases supersede a multitude of calculations, and even afford us theorems to which the most prolix computations could scarcely have conducted us." 39. On Triangular Pyramids, p. 149: an analytical determination of the content, and of the figures that may be inscribed in the pyramids, when their six sides are given. 40. Arithmetical Researches, p. 265: on the integral roots of equations of the second degree. 41. On Particular Integrals, 1774, p. 197. Laplace had already pointed out the occasional occurrence of integrals not included in the general and direct expression obtained by the usual modes of integration. Such values are here deduced from the variation of the quantities originally considered as constant, which often affords us an equation of a different form, and leads to values not comprehended in the regular expression of the integral. 42. On the Motions of the Nodes of the Planetary Orbits, p. 276. Euler, Lalande, and Bailly had found some expressions for the temporary change of position of the nodes: the equations are here integrated, and the total changes determined. 43. On Recurring Series varying in two ways, or on Partial Finite Differences, 1775, p. 183: with an application to the theory of chances, upon Laplace's principles. 44. On Spheroids, p. 273: a demonstration of Maclaurin's theorem (Fluxions, art. 653) concerning the attraction of a compressed spheroid or an amygdaloid; derived from the formulæ contained in the former papers. 45. Arithmetical Researches continued, p. 323: demonstrating some theorems of Fermat with which Euler had not succeeded; yet leaving others still unattempted. 46. On the Mean Motions of the Planets, 1776, p. 199: showing that all their changes are periodical. Laplace had detected an error in the author's reasoning when he attributed secular equations to the motions of Jupiter and Saturn, the expressions containing the terms in question being compensated by others which he had neglected. 47. Cases of Spherical Trigonometry solved by Series, p. 214: without any apparent advantage. 48. On Integration by continued Fractions, p. 236: gives an example of the binomial theorem converted into a continued fraction, which, however, exhibits no particular elegance nor simplicity. 49. On the Number of Imaginary Roots of Equations, 1777, p. 111. Harriot was the father of the doctrine of equations. Newton made great improvements in it, but his rule remains imperfect with regard to the higher equations, even with the additions of Maclaurin and Campbell. In the present paper the theorem of Waring is demonstrated, without any material attempt to extend it. 50. On the Diophantine Analysis, p. 140. It is remarked that Fermat left all his propositions undemonstrated, except this theorem, that the sum of two biquadrate numbers can never be a square. 51. On Escapements, p. 173: an investigation of the best forms of pallets for the dead beat and the recoiling scapements. 52. On determining the Orbits of Comets by three observations, 1778, p. 111–124. The first part of this memoir is historical and critical, and the author allows due credit to the ingenuity of Newton's method: his own does not appear to have been of any practical utility. 53. On the Theory of Telescopes, p. 163: comparing the general theorems of Cotes and Euler, and applying the method of recurring series to their demonstration; with a rule for determining the magnitude of the field. 54. On the Expression of the Time in a Conic Section, p. 181: after Lambert, who determines it from the chord of the arc described, the sum of the revolving radii, and the great axis: the theorem is here analytically demonstrated. 55. On Particular Integrals, 1779, p. 121: examples from some mechanical curves. 56. On Geographical Projections for Maps, p. 161–186. The methods here proposed for the construction of maps have been found too intricate for adoption. 57. On the Theory of the Libration of the Moon, 1780, p. 203. In the prize essay on the moon's libration, the author had made the first application of the method of variations: the investigation is here continued, and it is observed that the moon cannot be of homogeneous matter, nor its form such as would afford equilibrium to a fluid covering it, since the effects of the ellipticity, so determined, would be much less perceptible than they are. 58. Report on a Quadrature of the Circle, *Hist. Ac. Berl.* 1781, p. 17. This paper only requires to be noticed as a specimen of the author's condescension. 59. Theory of the Motion of Fluids, *Mém.* p. 151: an application of D'Alembert's principles to the phenomena of running fluids, and to the motion of waves; but founded on an arbitrary assumption with respect to the depth affected by the waves. 60. On the Secular Variations of the Elements of the Planets, p. 199. The theory of perturbations is here examined by two methods, either comprehending the general form of the orbit, or regarding the local effects only. 61. Report on a Mode of finding the Form of the Earth, *Hist.* 1732, p. 35: a proposal of no value whatever. 62. On the Secular Variations of the Planets, *Mém.* p. 169: a continuation of the former memoir, with all the details of the application, and a determination of the change of the place of the ecliptic, together with a demonstration of the permanency of the general arrangement of the system, depending on the exemption of the mean distances from all variations not periodical, while the other elements are liable to greater alterations. 63. On the Periodical Variations of the Planetary Motions, 1783, p. 161: a sequel to the memoirs on the secular variations. 64. Additions respecting the Secular Variations, p. 191: completing the examination, and extending it to the case of Jupiter and Saturn, which had before been investigated by Laplace. 65. On the Correction of the Errors of Astronomical Approximations, p. 224. The errors here considered arise from the employment of the powers of the arcs described in the equations concerned, these arcs increasing without limit: they may be avoided by means of approximations founded on the supposition of the variation of the elements. Laplace had before employed a method still more refined. 66. On a particular mode of Approximation, p. 279: resembling that which Briggs employed for making logarithms. 67. On a new property of the Centre of Gravity, p. 290: relating to the mutual distances of the bodies. 68. A direct and general determination of the Motion of a Comet, p. 296. In this third memoir the problem is reduced to equations of the eighth or seventh degree. 69. Theory of the Periodical Variations of the Planetary Motions, 1784, p. 187: continuation of the memoir of the preceding year, containing the independent variations of the eccentricities and inclinations for the six principal planets; with a numerical application of the formulæ demonstrated in the first part. 70. On the Integration of Equations of Linear Partial Differences, 1785, p. 174: entering into further details of the method laid down in a former paper, which is here applied to the problem of trajectories, a problem once proposed by Leibnitz as a trial of strength to Newton, who was not fully aware of the nature of the difficulty intended to be combated: it was, however, solved in England by Taylor, though indirectly. Nicolas Bernoulli and Hermann gave a more complete solution, and Euler added still more to the generality of the investigation. The author observes that the problem is a mere curiosity; there is, however, one case in which a trajectory of the kind here considered is actually applicable to a natural phenomenon of common occurrence, which is that of a wave diverging from a point in a gradually shelving shore; for the figure or direction of the collateral parts of such a wave may be shown to be the orthogonal trajectory cutting an infinite number of cycloids beginning at the given point. 71. On the Motion of the Aphelia of the Planets, 1786, i.; a geometrical investigation, in the manner of Newton, intended as an appendix to the *Principia*. 72. On the Theory of Sound and Waves. This paper is also intended to complete the demonstrations contained in the same work. The volume, in which both these interesting memoirs appear, seems to have been published out of the regular order, from some circumstances connected with the death of Frederick; and it is wanting in many of the British libraries. 73. Note accompanying a Memoir of Duval le Roi, 1786–7, p. 253. On the Secular Equations of the Georgian Planet. 74. On a Question relating to Annuities, 1792–3, p. 235: the case of an annuity supposed to commence after a death, and to cease at a given age. 75. Additions to former Memoirs, p. 247: on recurring series (n. 43); on elliptic spheroids (n. 38); on interpolations, in Mouton's manner, comprehending the inequality of the distances of the observations; on the secular equation of the moon (n. 64.) After Laplace's great discovery of the cause of the secular acceleration, Lagrange found that it might have been easily deduced from his own calculations, almost in the same form, if he had not accidentally neglected the application, from having assured himself, in 1783, that the results of a similar computation were nearly insensible in the case of Jupiter and Saturn. It was in 1787 that the discovery of Laplace was announced. The acceleration here computed is 10″·5 for the first century after 1800. Mayer found it 9″, from a comparison of observations. 76. On a general Law of Optics, 1803, *Math.* p. 3: a demonstration of the foundation of the method long used by English opticians for determining the magnifying powers of telescopes of all kinds, which form an image of the object-glass beyond the eye-glass, by measuring the diameter of that image. The author hazards, in this paper, the very singular assertion, that the illumination of the object must be the same in all telescopes whatever, notwithstanding the common opinion, that it depends on the magnitude of the object-glass; and his reasoning would be correct if the pupil of the eye were always less than the image of the object-glass in question; since, as he observes, the density of the light in this image is always inversely as the magnifying power; but he forgets to consider that the illumination on the retina, when the whole pencil is taken in, is in the joint ratio of the density and the extent; a consideration which justifies the common opinion on this subject, and shows that a most profound mathematician may be grievously mistaken in his conclusions, if he proceeds to calculate upon erroneous grounds. It deserves, however, to be remembered, that the brightness of any given angular portion of a magnified image must always be somewhat less than that of an equal portion of the object seen by the naked eye; because it can be no greater if the pencil fills the pupil, and will be less in proportion as the pencil is smaller than the pupil, besides the unavoidable loss of light at the refracting surfaces.

77. The later works of Lagrange have principally been published at Paris, and most of them in the various collections of the academy. The earliest of these are the prize memoirs; and, first, the essay on the Libration of the Moon, which obtained the prize in 1764, *Ac. Par.* Prix. ix. 1772. It is in this memoir that the method of variations was first practically applied to a mechanical problem.

78. On the Inequalities of the Satellites of Jupiter, in 1776; including the consideration of their mutual perturbations, and consequently a case of the problem of six bodies. The author never resumed the subject, but its investigation was completed by Laplace. 79. A New Method of solving the Problem of Three Bodies, in 1772. 80. On the Secular Equation of the Moon, in 1774, *M. Sav. Etr.* vii. for 1773: an unsuccessful attempt, with conjectures respecting the existence of a resisting medium, and even doubts of the accuracy of the foundation of Halley's discovery. 81. A prize memoir, On the Perturbation of Comets passing near Planets, *M. Sav. Etr.* x. Par. 1785, p. 65: finding the path directly, without regard to the conic sections, and employing three different modes of computation for the different parts of the orbit. 82. On forming Tables by observations only, *Mém. Ac. Par.* 1772, i. p. 513. The method of recurring series is principally employed, and the author observes, that the problem is more useful than difficult, giving an experimental example in the equation of time, for which he obtains, from the results of the tables, an expression very near the truth. Delambre remarks that this is only a continuance of the system adopted by Ptolemy and the other ancient astronomers, showing what we might have done in a circuitous manner by pure mathematics, if Newton and the laws of gravity had not existed; and he thinks the paper only valuable as a specimen of Lagrange's talent for overcoming difficulties which he might more easily have avoided. 83. On the Nodes and Inclinations of the Planetary Orbits, 1774, p. 97: with details of the calculations for all the planets. 84. On the Variation of the Elements of the Planets, *Mém. Math. Inst.* 1808, p. 1. The object of this paper is to show, as Poisson had done before, that all the changes of the system are periodical. The method is more general, but less simple, than that of Laplace, who first discovered the principle by induction. The lunar acceleration is given as an example. Mr Poisson has extended his calculations to quantities of the second order, which do not enter into Lagrange's investigations. 85. On the Variation of Independent Quantities in general in Mechanical Problems, p. 257. The author observes, that many of the modern improvements of mathematics depend on the doing away the distinction between constant and variable quantities, which was so valuable when it was first enforced by Descartes. 86. A second Memoir on the Variation of Independent Quantities, 1809, p. 343: simplifying the general application of the doctrine.

87. Lectures on Arithmetic and Algebra, *Séances des Ecoles Normales*, year III. 1794–95. The first lecture relates to the elements of arithmetic, the second to the lower orders of equations, and the third to the higher. All these lectures, under the name of conversations, were taken down in short-hand by some of the students, and afterwards corrected by the professors.

88. An Essay on Political Arithmetic, Roederer, *Collection de divers Ouvrages*, Paris, an. IV. 1795–96.

89. In the *Journal de l'Ecole Polytechnique*, we find an Essay on Numerical Analysis, and on the Transformation of Fractions, vol. ii. 1798, p. 95. It contains the elementary theory of continued fractions, and the mode of reducing them. 90. On the Principle of Virtual Velocities, p. 115: chiefly relating to pulleys. 91. On the Object of the Theory of Analytical Functions, vi. 1800, p. 232: a detailed explanation of the grounds of the theory laid down in the separate publication on this subject. 92. Analysis of Spherical Triangles, p. 270: giving all their essential properties in a concise form. 93. Lectures on the Calculus of Functions, xii. 1804: published also separately in 8vo: a commentary on the theory of functions, and a supplement to it, contained in twenty lectures. 94. Two more Lectures, xiv. 1808: at the end, chiefly relating to the method of variations. 95. On a Difficulty respecting the Attraction of Spheroids, viii. xv.: remarks which may serve as a commentary on a passage of the *Mécanique Céleste.*

96. On the Origin of Comets, *Connoissance des Tems*, 1814. 97. On the Calculation of Eclipses, as affected by Parallax, 1817: from the *Berlin Almanac* for 1782. This memoir, as Delambre observes, is singularly attractive to a person previously unacquainted with the methods which are employed; but though the formulæ first introduced are direct and rigorously accurate, the whole investigation ends in an approximation which wants both these properties.

98. The most important of all the works of Lagrange are those which have appeared in separate volumes; and among these we may reckon his Additions à l'Algèbre d'Euler, 8vo, Lyons, 1774, vol. ii.; German, 1796; English, 1797. They relate chiefly to continued fractions and to indeterminate problems, and constitute the most valuable part of the whole work, which, in its abridged form at least, is far inferior to Maclaurin's Algebra. 99. Mécanique Analytique, 4to, Par. 1788, 2d edit. vol. i. 1811; vol. ii. by Prony, Lacroix, and Binet, 1815. This work exhibits a uniform and elegant system of mechanical problems, deduced from the simple principle of virtual velocities, which was well known to former authors, but never so extensively applied. It has been remarked, that many parts of it may be read with advantage, even by those who are not competent to enter into any of the computations, exhibiting such a history of the progress of the science, as could only have been sketched by a master. The new edition, begun at the age of seventy-five, comprehends all the improvements contained in the author's later memoirs on various subjects. 100. Théorie des Fonctions Analytiques, 4to, Par. 1797, 1813. The abstract theory of analytical functions has been very fashionable among modern mathematicians; but the improvements which it contains are chiefly of a metaphysical nature, if they can with propriety be called improvements. The notation is less simple than that which is in common use, and has been abandoned by the author in some republications of the works in which he had at first employed it. The calculations, too, are often more intricate than others which afford the same conclusions. 101. Résolution des Equations Numeriques, 4to, Par. 1798, 1808. The refined and abstruse speculations contained in this volume are more calculated to promote the advancement of the abstract science of quantity, than to be applied, as the title would seem to denote, to the purposes of numerical computation. The methods investigated are in general laborious and complicated, though instructive, and capable of extensive application; and for equations of which all the roots are real, the author himself recommends Mr Budan's method, as preferable to his own. The second edition contains a number of very interesting notes, which are full of ingenuity and novelty.

The author of so immense a series of laborious investigations must certainly have been a most extraordinary man. He had acquired the character of an illustrious mathematician almost in his boyish years; and he continued to apply the force of his powerful mind, for more than half a century, to the almost uninterrupted pursuit of his favourite sciences. It seems, however, that his earliest were also his greatest successes; and all that followed was as little as could well be expected from a continued employment of the means which he possessed at the beginning; for, in fact, the whole taken together appears to bear a stronger character of great industry, than of great sagacity or talent.

"It was formerly usual," says Delambre, "for mathematicians to inquire, in every investigation, for some general considerations, which might be capable of simplifying it, or of reducing it to a problem already resolved, and to endeavour by these means either to abridge the calculation, or sometimes to supersede it altogether. But since the discovery of the infinitesimal calculus, the facility and universality of this method, which often renders the possession of *any talent in the calculator wholly unnecessary*, has made it more usual for mathematicians to direct their chief attention to the perfection of this all-powerful instrument. But, at the present day, when researches of this kind appear to be completely exhausted by the labours of Euler, Lagrange, and their industrious contemporaries, it might perhaps be more advisable to return to the ancient method, and to follow the example of" Newton, surely, and of " Daniel Bernoulli, who, as Condorcet observes, was entitled to the praise of moderation in the introduction of his calculations. Lagrange was in the habit of employing his sublime talents in a different manner. He liked to make every thing dependent on his analysis, though, in some instances, he united both methods in the highest degree, as his invention of the calculus of variations bears witness. His reducing the theory of sound to that of the vibration of chords, is a specimen of a very ingenious simplification; as well as his mode of computing the planetary motions by the variation of the elements of their orbits, which is also applicable to all other cases of the operation of small disturbing forces. But it must be confessed, on the other hand, that he has sometimes created difficulties where none existed, by applying his profound and ingenious methods to the solution of elementary problems, which may be obtained from a construction of the simplest kind; and the powerful agents which he employs, on many trifling occasions, remind us only of the man in the fable, who came to borrow the club of Hercules, and the thunder of Jupiter, for the purpose of destroying a flea;" or of the modern mathematician, who, without any fable, or any figure of rhetoric, proposed to adjust a standard measure by placing it at a distance and viewing it with a good telescope. The habit of relying too confidently on calculation, and too little on common sense, will perhaps account for the mistakes of Lagrange which have been already noticed, respecting the forms of columns, and the illumination of optical instruments; nor are they the only instances of the kind which may be produced from the modern history of the sciences. It seems, indeed, as if mathematical learning were the *euthanasia* of physical talent; and, unless Great Britain can succeed in stemming the torrent, and in checking the useless accumulation of weighty materials, the fabric of science will sink in a few ages under its own insupportable bulk. A splendid example has already been displayed by the author of the article ATTRACTION; and, to do justice to our neighbours, it must be allowed that they have received the boon with due gratitude, and acknowledged it by merited applause: " All the analytical difficulties of the problem," says Legendre and Delambre (*Mém. Inst.* 1812) " vanish at once before this method; and a theory, which before required the most abstruse analysis, may now be explained, in its whole extent, by considerations perfectly elementary." It is indeed only when a subject is so simplified that the investigation can be considered as complete, since we are never so sure that we understand the process of nature as when we can trace at once in our minds all the steps by which that process is conducted. It is not without some reason that a similar disposition to revel in the luxury of mathematical sports has been sometimes objected to Laplace, a man of equal analytical acquirements with Lagrange, but possessed apparently of greater sagacity, and certainly more successful in his application of mathematics to physical researches, although he also seems, on some occasions, to have suffered his habits of abstract reasoning to lead away his attention from the true conditions of the problem, particularly in his first supplement respecting capillary attraction, which concludes with an equation so erroneous, that he has been obliged to abandon it in silence. (See the article COHESION.) Another instance of ill-applied computation has been noticed in the article CHROMATICS; when Laplace attempted to deduce the laws of extraordinary refraction from the principle of the minimum of action, he seems to have forgotten that the demonstration of that principle, in his own great work, rests *expressly* on a condition which is here wanting, that " the forces concerned must be functions of the distances," and of course independent of the directions. These imperfections, however, do not deserve to be noticed as materially affecting the general merits either of Lagrange or of Laplace, but they may be considered as accidents which ought to warn us against relying too implicitly on authority, however high, when it appears to militate against clear, simple reasoning, and sound common sense.

(Delambre, *Mém. Inst.* 1812, ii.; *Journal de l'Empire*, 28th April 1813; Virez et Potel, *Précis Historique*, Paris, 1813, in 4to; Cossali *Elogio*, Padua, in 8vo, 1813; Maurice in *Biographie Universelle*, xxiii. Paris, in 8vo, 1819.)

LAHDACK, a mountainous district and independent Tartar kingdom in Northern Hindustan, situated to the north of the great Himalaya ridge of mountains, principally between the thirty-fourth and thirty-seventh degrees of north latitude. It is bounded on the north and east by Thibet, on the west by Cashmere, and on the south by the Nahry Sangkar province. These limits are not, however, precisely defined. This country imports from Thibet fine goats' hair or shawl wool, which is re-exported to Cashmere, and there manufactured into shawls; and its exports consist chiefly of fruit. The inhabitants are supposed to be worshippers of the Delai Lama. This country, since the British conquests, has been extended to the Himalaya Mountains, and has been penetrated by British functionaries, amongst others by Mr Williams; and from his information, and the drawings which he exhibited, the inhabitants seemed to Bishop Heber to resemble the Kalmucks in dress, countenance, and religion. Their written character is, however, different from the Mongolian. They carry on a pretty regular intercourse with Russia; and it is singular that sheets of gilt leather, stamped with the imperial eagle, were amongst the presents which the king of Lahdack sent when he offered his allegiance to the British government. The capital is of the same name; it is the mart of all the trade that is carried on in the country, and is the rendezvous of the merchants who travel from Hindustan to Yarkand in Chinese Tartary, whence they proceed in a body the greater part of the way along the banks of the Indus. The position of this place is extremely uncertain. According to the best maps, it is placed in long. 78. 3. east, latitude 35. 35. north, two hundred miles north-east from the city of Cashmere. These Tartars have showed themselves very friendly to the British; and their Khan, as is stated by Bishop Heber, sent a formal offer of his allegiance to the British government, which was declined. At a point above the town of Drans, in Little Thibet, the main stream of the Indus is met by a smaller river, which has been traced from Rodauk in Thibet, and flowing past Lahdack, the capital of Little Thibet, is then named the Lahdack River. Near to Lahdack it is joined by another stream from the north-west, which Lieutenant Macartney conjectures to issue from the Lake of Surikol. It was formerly thought that this river was one of the principal branches of the Ganges, but it is now ascertained to be a tributary of the Indus.

LAHIJAN, a town of Persia, in the province of Ghilan, once the metropolis of the province; but having revolted against Shah Abbas, it was taken and demolished, Lahore.

and has ceased to be of any importance. It is eight miles east of Reshd.

LAHORE, an extensive province of Hindustan, situated between the thirtieth and thirty-fourth degrees of north latitude. It has been estimated at 340 miles in length by 200 in average breadth. It is bounded on the north by Cashmere and the course of the Indus; on the south by Delhi, Ajmeer, and Moultan; on the east by the mountains of Northern Hindustan; and on the west it is separated from Afghanistan by the Indus. The principal geographical and territorial subdivisions are the Punjab, comprehending other minor subdivisions, and the Kohistan of Lahore. Into these two districts the country is nearly equally divided. The Kohistan is the mountainous tract which occupies the whole north-eastern division, and the Punjab is the flat country to the south-west, so called from the five celebrated rivers by which it is intersected. The mountainous district is not so fertile as the plains. On the sides, however, of those mountains, which are inhabited, wheat, barley, and various other small grains, are produced. There are spaces which project from the body of the hills, in separate flats, in the form of semicircular stairs. Into those projections the soil is propelled by the rains which fall in this quarter from June to October, and the earth washed down is preserved in that state by buttresses of stones. Rice is cultivated in the narrow valleys, but the inhabitants subsist chiefly on wheat-bread and peas made into a thick soup. Pines and willow trees grow on the face of the mountains. The resinous part of the fir is cut into slips, and supplies the place of a lamp. The climate is not favourable to fruits and vegetables. Fossil salt is found in many parts, and the mountainous tracts are supposed to be rich in minerals.

The flat country called the Punjab, or the country of the five rivers, is by far the most productive, though its fertility has been too much extolled, having been represented as the garden of India, which, under a good government, it might have been, from its advantageous situation and its numerous rivers. But it has been exposed to such various revolutions, and has been so much harassed by the contests of the petty Sikh chiefs by whom it is possessed, that it has not profited so much as might have been expected of its natural advantages; and accordingly, except in the immediate vicinity of the rivers, no portion of it is to be compared with the British provinces in Upper Hindustan, and still less with Bengal. The agricultural productions of the Punjab are, in general, wheat, barley, rice, pulse of all sorts, sugar-cane, tobacco, and various fruits. The province of Lahore is watered by the Indus, the Sutlege or Hysudrus, the Beyah or Hyphasis, the Ravey or Hydraotes, the Chinaub or Acesines, and the Jhylum or Hydaspes. That part of the Punjab east of the Jhylum, and the nearest to that river, which is flat, is chiefly pastured by herds of oxen and buffaloes; and that most to the east towards the Sutlege, which is wavy, though the most sterile in quality, is the best cultivated. East of the Jhylum there is not a hill; the trees are few, and cultivation is extremely scanty. It contains, however, many fine villages, and some large towns. But the latter, with the exception of Amritsir, the holy city of the Sikhs, are mostly tending to decay.

The commerce of this country was formerly much obstructed by the heavy duties levied on all the goods as they passed through the different territories of the petty Sikhs. It was in consequence carried to Hindustan Proper by the difficult and mountainous route of Jamboe, Nadone, and Serinagur. The Sikh chiefs, however, discovered their error, and many of these heavy and vexatious duties have been reduced; and, by a more strict administration of justice, confidence has been restored to the merchants. The exports from Lahore to the countries west of the Indus are, sugar, rice, indigo, wheat, and white cotton cloths. The imports from these countries are, swords, horses, fruit, lead, and spices. The exports to Cashmere are nearly the same as to Persia; the imports being shawls, a variety of cloths, saffron, and fruits. With Kohistan, the mountainous division of Lahore, the inhabitants of the Punjab exchange cloth, matchlocks, and horses, for iron and other smaller commodities. From the south are imported sulphur, indigo, salt, lead, iron, European coarse broad cloth, and spices. The exports to the south are, horses, camels, sugar, rice, white cloth, matchlocks, swords, bows and arrows.

Lahore.

Lahore contains a mixed population of Sikhs, Singhs, Jauts, Rajpoots, Hindus of lower castes, and Mahommedans; the latter a poor, persecuted, despised race, and not numerous. Few of their mosques have escaped destruction. The lower orders of the Sikhs are protected from the tyranny and violence of their chiefs by the precepts of their common religion, and by the privilege which they possess of abandoning a leader whom they dislike, the distance of a few miles placing them under the protection of his rival. In the Punjab it is reckoned that one third of the inhabitants are Singhs or Sikhs. A considerable number of cultivators are Jauts. The natives are composed of different classes of Hindus. Amongst the mountaineers the goitre or swelled throat is common. On the north-western borders of Lahore the inhabitants are chiefly Afghans, who live in small forts or walled villages, in mutual dread of each other. This quarter is exposed to the depredations of the Sikhs on the Attock and on the adjacent districts. In the Punjab, fakeers or religious devotees and mendicants are common, and are frequently seen travelling about in a palanquin clad in silk, with a great retinue of attendants on horse and foot. These are extremely proud, and in general insolent and abusive to Europeans. The Singhs are active and robust, and have in general the Hindu cast of countenance, somewhat altered by their long beards. They are very courageous, and, under the influence of prejudice or religion, are brave even to desperation. They are all horsemen, though they serve as infantry in foreign armies; of a bold and rough address, speaking invariably in a loud, bawling tone of voice.

Sikh, or Siksha, is a Sanscrit word signifying disciple or devoted follower. The founder of the sect was called Nanak, who was born at the village of Tulwundy, in the district of Bhatti and province of Lahore, A. D. 1419, and died at Kirthipoor Dehra, on the banks of the Ravey. He left two sons, from whom are descended 1400 families, called Shahzadehs, who are greatly respected, and live at Dera, in the Punjab. The descendants of this person ruled amongst the Sikhs, who, during the succeeding centuries, gradually increased in strength. Gooro Govind, who was expelled from Lahore during the reign of Aurungzebe, and is supposed to have died in 1708, new-modelled the government of the Sikhs, and converted them into a band of ferocious soldiers, changing their name from Sikh to Singh, signifying a lion. This person is revered by the Sikhs as the founder of their worldly greatness and political independence, as Gooroo Nanak is of their religion. After the death of Aurungzebe, the Sikhs grew in strength, and wasted the country. On the dissolution of the government which took place at Lahore subsequent to Nadir Shah's invasion of India, the power of the Sikhs increased; and, during the first invasion of the Afghans in 1746, they possessed themselves of a considerable portion of the country between the Ravey and Jallinder. In 1762 and 1763 they were almost exterminated by Ahmed Shah Abdalli and the Afghans; but by their undaunted resolution they still rose superior to their misfortunes, and at last succeeded in acquiring and consolidating their present territories. For many years prior to the appearance of Runjeet Singh, this whole country was distracted by the internal feuds that took place between the different chiefs, every village being an object of dispute between brothers and near relations. This powerful chieftain rose into political power from small beginnings. So recently as the year 1805, when Lord Lake advanced into the Punjab, he was contending for ascendency amongst merely rival chiefs. But between this and the year 1812, he had brought almost the whole of the petty princes in the Punjab under his authority, and was even encroaching to the south-east, beyond the boundary of the Sutlege, when he was opposed by the British, with whom, however, he showed not the least desire to contend. Being sensible of his own inability to oppose the British power, he willingly agreed to a treaty of alliance and friendship, by which the latter agreed to relinquish all concern with the territories of the rajah to the north of the Sutlege; and the rajah on his part agreed never to maintain, in the territories occupied by him or his dependents to the south of that river, more troops than were necessary to carry on the internal police of the country, and also to abstain from encroaching on the chiefs to the south of that boundary. Runjeet Singh is an ambitious chief, and he is extremely anxious to improve and increase the warlike resources of his kingdom. His troops are manœuvred according to the European fashion; they are drilled by European officers, and make a formidable appearance in the field. But they are still very far inferior to the British troops in India in all military qualities; and the Sikh monarch is too wary to risk his recently acquired power in such an unequal contest. He is perpetually endeavouring to extend his territories towards the south and east. He has made several attempts on the hilly country of Cashmere, which have all been unsuccessful. We have no accurate estimate of the population of the Sikh territories. It was the boast of these warlike tribes at one time that they could bring 100,000 horsemen into the field; but at present so large a force could not possibly be mustered among them.

Lahore, the capital of the above province, is situated on the south side of the Ravey River, which is here about three hundred yards wide. It is surrounded with lofty walls, decorated on the outside, but hastening to ruin, as are most of the private buildings. It is still a place of considerable size, with a good bazar; but it is not inhabited by wealthy people. On account of the frequent sackings it has sustained, they have migrated for safety to Amritsir. The palace was originally founded by Acbar, and enlarged by his successors. Across the Ravey, at Shah Durra, about two miles north of Lahore, stands the celebrated mausoleum of Jehangeer, within a wall of nearly 600 yards square. It is a magnificent building, sixty-six paces on each side, and still in very good condition. To the southward of this, in the open plain, is to be seen the tomb of Noor Jehan Begum, a building thirty-six paces square. In 1812 Runjeet Singh was building a very thick wall and rampart round the city, with a deep, broad ditch. The palace has also been surrounded by a deep and broad ditch, the whole faced with brick, and the earth thrown inwards, so as to form a broad rampart, with bastions at intervals. The city is verging to decay; yet the domes and minarets of the mosques, the lofty walls of the fort, the splendid mausoleum of Jehangeer, and the numberless inferior tombs and temples that surround the town, still render it an object of curiosity and admiration. Lahore was taken by Sultan Baber, A. D. 1520, and was for some time the seat of the Mogul government. Since that period it has undergone many revolutions, and was for a considerable time possessed by the Abdalli Afghans of Cabul, by whom it is named Sikrei. For the last thirty years it has been under the domination of the Sikhs, and has latterly been the headquarters of Rajah Runjeet Singh, the powerful chieftain of that predatory people. The travelling distance from Delhi is 380 miles, from Lucknow 639, from Bombay 1070, and from Calcutta 1356 miles. Long. 74. 3. E. Lat. 31. 36. N.

LAHR, a city of the duchy of Baden, in Germany, in the circle of Kinzig. It stands on the river Schutter, which runs to the Rhine, is surrounded with walls, and contains 600 houses, with 4660 inhabitants. It is a place of manufacturing industry, producing cotton and woollen goods, and various other commodities.

LAIBACH, or Laybach, one of the governments into which the Illyrian province of Austria is divided. It extends over 8394 square miles, and contains twenty-five cities, forty-two market-towns, and 5947 villages and hamlets, with 611,730 inhabitants. It is for the most part mountainous, except in the centre, where it is level and fertile. Its chief products are corn, fruit, wine, wood, iron, copper, and marble. The capital is a city of the same name, situated on the river from which that name is derived. It is well built, but antique, and contains a cathedral, with ten other catholic churches, two hospitals, 980 houses, and about 10,000 inhabitants. Above the town, on a hill on which it is built, is a strong fortress, at present appropriated to the confinement of criminals. There is a collegiate establishment, with a rector and twenty-one professors, who superintend the instruction of students in theology, philosophy, law, and medicine, and confer degrees in each of these faculties. There are manufactures of silk, of ribbons, of china-ware, of leather, and of various chemical productions; and an extensive trade is carried on with Italy, with Bavaria, and with Croatia. Long. 14. 41. 10. E. Lat. 46. 1. 48. N.

L'AIGLE, a city of France, in the arrondissement of Mortagne, and department of the Orne, situated on the river Rille. It contains 844 houses, and 5850 inhabitants. There are several manufacturers of linen and cotton goods; but it is especially celebrated for its needles, pins, and other small articles of iron and steel.

LAING, Malcolm, a distinguished constitutional lawyer and historian, was born on the 13th of January 1763, at Strynzia, his paternal estate, situated on the mainland of Orkney. He received the rudiments of his education at the grammar-school of Kirkwall; and, when he had attained the proper age, he was sent to the University of Edinburgh, where he completed his elementary studies. Here he not only made the acquaintance, but gained the friendship, of many young men of great promise, who afterwards rose to eminence in different walks of life. He was admitted a member of the Speculative Society, which had for its object general literature and science. It had been founded about twenty years before, and, during that period, numbered amongst its members all the distinguished youth of Scotland, as well as many foreigners of distinction. "Laing," says Sir James Mackintosh, "was most acute and ingenious, but his meaning was obscured by the brevity which he too much pursued in his writings, and by an inconceivable rapidity of utterance.[1]

Mr Laing passed as advocate in the year 1784. Whether he had any predilection for the profession of the law, or made choice of it merely for the respectability it confers, and the opportunity it sometimes affords of attracting notice as a politician, we have had no means of ascertaining. It seems certain, however, that notwithstanding his general talents, and his great powers as a close and vigorous reasoner, he was never much employed professionally, nor known as a successful practising barrister. It will not altogether account for this failure to attract business, that the manner in which he delivered his arguments was neither dignified nor pleasing; that, in fact, his speeches were uttered with an almost preternatural rapidity, in harsh and disagreeable tones. Such reasoning as he was accustomed to employ scarcely required the extraneous assistance of manner to recommend it, even to a jury; whilst, at the period in question, nearly all the pleading in Scotland was addressed solely to the judges, whose well-disciplined intellects might have been supposed more likely to acknowledge the force of reason and of argument, even when divested of all extrinsic attractions, than to be moved by rhetorical elegance or by holiday declamation. Laing has evinced, in his writings, an intimate acquaintance with almost all the departments of Scotch law; in treating historical subjects, he skilfully availed himself of this knowledge, as well as of the experience which he had acquired in his profession; and hence, taking all the circumstances into view, it may safely be concluded that the limited extent of his practice is to be attributed rather to his own choice than to any deficiency of talent or want of aptitude for conducting forensic business. Nor will this conclusion be weakened by the perusal of the admirable address which he delivered in defence of Gerrald, one of the foredoomed victims of the persecution that then raged against the advocates of a reform in the representation of the people; an address so clear and cogent in its reasoning, so irresistible in its deductions, that it must have carried conviction to all minds except those of a time-serving jury and of political judges.

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[1] *Memoirs*, &c. vol. i. p. 27.

In 1790 or 1791, Mr Laing, and his friend Mr Adam Gillies, now Lord Gillies, took a house, which they furnished, and in which they continued to live together until the year 1801, when Mr Gillies married. During the whole of this period, Mr Laing was much engaged in researches relative to the history of Scotland; and in the course of it also, he formed an acquaintance and commenced a correspondence with Mr Fox, which appears to have continued with but little interruption until the death of that illustrious statesman.

The first fruits of his laborious investigations were employed in preparing for the press the last volume of Henry's History of Great Britain, which the author, at the time of his death, had left incomplete. The matter collected by Henry did not extend to a period at which the work could with propriety be terminated; and Mr Laing was requested by the author's executors to write two additional chapters, to which, when completed, he annexed a dissertation on the crimes attributed to Richard III. The labours of two such authors, so very different in their views, character, and style, could not be very aptly united in the same volume, much less amalgamate or coalesce into a whole; besides, many persons considered Mr Laing as an uncompromising liberal, whose historical deductions seemed harsh and prejudiced, when compared with the calm and subdued narrative of Henry. But, however dissimilar these writers may have been in their style and manner, as well as in their respective modes of treating historical subjects, there are few persons, at least in the present day, who will be disposed to give the preference to the latter. Henry was a man of good sense and considerable industry, but, of all our historians, perhaps he is the least philosophical; and if he appears calm and moderate, he does so because he is an entire stranger to strong opinions and strong sympathies. Laing, on the other hand, was a man of vigorous judgment and profound speculation; he had no taste whatever for the romance of history; and if he argued keenly in support of the opinions which he had adopted, he did so, not like a man who is determined to maintain a point merely because he had asserted it, and felt personally interested in showing it to be true, but as one who, having considered the matter maturely, had submitted it to the arbitration of his own judgment, and was resolved to annihilate all those prejudices which prevented others from seeing it in the same light in which it appeared to himself. It is absurd to blame an historian for his opinions, because that is equivalent to censuring him for his honesty; it is only when, as has sometimes happened, he distorts facts in order to support preconceived opinions, instead of regulating his opinions according to the ascertained facts, and taking care that the one shall be a legitimate deduction from the other, that he merits reproach and condemnation. The sole object of Mr Laing was to discover truth; and there can be no doubt whatever that he sought the truth in the love of it. It is not impossible that his prepossession in favour of the class of principles which he had adopted may, in some instances, have led him to deduce hasty or improper conclusions from the facts he had ascertained; but although the stern severity of his character was calculated to provoke opposition, and even to envenom criticism, no political adversary has ever accused him of perverting facts. His historical probity, indeed, has been tacitly recognised even by those who were most bitterly opposed to the opinions and doctrines which he laboured so strenuously to inculcate. To Mr Laing has sometimes been ascribed the Memoir of Henry, which accompanied the last volume of his History; but, if we are not greatly misinformed, it was drawn up by Sir Henry Moncrieff, the leading executor, by whom Mr Laing had been induced to write the continuation.

The publication of this work was partly the occasion of procuring Mr Laing the notice and acquaintance of Dr Parr. In an original letter, dated Hatton, near Warwick, 22d of March 1794, and addressed to Malcolm Laing, Esq. the latter says: "Often have I told our illustrious friend, Mr (afterwards Sir James) Mackintosh, of the pleasure and the instruction which I have received from your continuation of Dr Henry's History. I saw with delight the comprehensive and elevated views which your mind takes of general politics. I thought your statement of the controversy about Warbeck so correct, your proofs so apposite, and your reasoning upon them so acute and impartial, that not one lurking weed of a doubt will ever shoot up again in my own mind." And, in another part of the same letter, the writer adds, "The energy of your style, the extent of your inquiries, and the solidity of your observations, have increased the interest which I had long ago taken in the reputation of this history; and I am speaking from motives, selfish if you please, but such as no man of letters would deign to dissemble, when I express my earnest wishes that your professional engagements would permit you to finish a performance, in which you have already engaged so far as to impress every intelligent reader with the most favourable opinions of your taste, judgment, and comprehensive researches."

But the more immediate occasion of this letter was one which does infinite credit to the heart and the feelings of the distinguished writer, whilst it forms a sort of epoch in the career of Mr Laing. On the 3d of March 1794, Joseph Gerrald had, after a mock trial, been convicted of a crime which had no existence before, on a law created for the occasion, by a verdict pronounced without legal evidence. Mr Laing had been counsel for Gerrald, in behalf of whom he delivered one of the most able and convincing addresses that ever proceeded from the bar; and Gerrald, again, had been a favourite pupil of Parr, who, notwithstanding all his errors and follies, still retained for him the affection of a parent. "Gerrald," says he, in the letter already quoted, "Gerrald, whom you have protected as a client, I taught as a boy. Dissipated as he has been by the pleasures, and worn out by the cares, of a most unhappy life, he presents, and can only present, to your view the broken and deformed ruins of a mind originally great. But my recollection is often carried back to his better days; to the powers of his genius, when they were unfolding themselves in a genial and fruitful spring; to the beneficial and rapid effects of the culture I bestowed on them during their evolution; and to the rich harvest of knowledge which I once had in prospect for him, when time should have matured those talents which nature had conferred, and education cherished. In this season of sorrow, or, I should rather say, this crisis of danger, his follies and irregularities make me cling, with more eager efforts of remembrance, to the contemplation of endowments so blasted, and of virtues doomed so soon to decay. But forgive me, if, by associations so natural to a lettered mind, I find relief in turning aside from the horrors of his situation, to express my gratitude for the benevolence, and my veneration for the abilities, of that man, who has endeavoured to shield him from the merciless arm of oppression. You, sir, sympathise, as I do, with his sufferings. You are struck, like myself, with admiration, even at the diminished glories of his genius. You have defended him as I could not do, in the course of his trial. You visit him, as I wish to do, and you console him, amidst the gloom of his confinement. For all these masterly exertions, and all these humane offices, in favour of poor Joseph, I entreat you to accept the tribute of my praise and my thanks." This truly eloquent letter concludes with a most affecting prayer, that "when he (Gerrald) is removed to that dreary shore, from which he never will return, his spirit may not be broken down by the severities of banishment; that his misfortunes may lead him into a train of wise and virtuous reflection; that his old age may be calm; and that his death may be an hour of serenity and resignation." Mr Laing, in replying to this "inestimable letter," which has hitherto remained unpublished, observes, in reference to his ill-fated client:—"In the cause of liberty others may have experienced a punishment, severer if possible, not more iniquitous. Voluntarily to await a sentence which he foresaw was inevitable, and knew to be illegal, exalts him to the rank of the most illustrious martyrs of freedom, and will render his trial memorable, whether the constitution which he sought to regenerate shall perish or survive. In a remote exile, inaccessible unless to the prayers of his friends, he will enjoy the dignified consolation of having discharged his duty to society, and the conscious possession of a mind superior to vicissitudes, not to be broken by misfortune or woe."

But, to return from this digression, whatever defects some may have discerned in the continuation of Henry's History, the public generally appreciated the merit of the work, and honoured the author with its approbation. Thus encouraged, Mr Laing continued his historical labours, and, having directed his attention to his native country, published, in the year 1800, his History of Scotland, from the union of the crowns, on the accession of James VI. to the throne of England, to the union of the kingdoms, in the reign of Queen Anne: And this was accompanied with two dissertations, historical and critical; one on the Gowry conspiracy, and the other on the supposed authenticity of Ossian's Poems. As in the previous case of Dr Henry's History, this work proved very dissimilar in its character to that of which it was in fact intended as a continuation; we mean, the History of Dr Robertson. Of the elaborate elegance, the studied rhythm, the balanced cadences, and the academical polish, which distinguish the style of the latter, it is almost entirely destitute. It cannot be pronounced either harsh or inelegant, but it is certainly complicated; and, from the constant effort made to compress a great deal of meaning into few words, it becomes occasionally obscure. It is terse and vigorous, but hard and abrupt; without volume, fluency, or elasticity. The continuity is in the thoughts rather than in the expressions; the sequence of the ideas is complete, but their full development is often left to be supplied by the mind of the reader. In the art of narration, he is as much inferior to Robertson, as he surpasses him in all the higher attributes of a philosophical historian; in tracing events and actions to their true causes and motives, disentangling intricate and perplexed questions, sifting evidence, and steadily exploring his way through the mazes of contradictory testimony. In his remarks and reflections, he also displays a depth and originality of thought which Robertson could never have reached, as well as an adventurous boldness of speculation from which the latter would have shrunk with dismay. But his chief merits consist in the great critical power he displays in discussing complicated questions of evidence; in seizing and steadily keeping in view the strong points of each case, as it comes before him; in the mastery which he exercises over all the resources of analysis; in the inflexible perseverance with which he pursues his investigations; and in combining the acuteness of the practised lawyer with the discrimination of the close observer of human nature. Hence, the separate dissertations, though to some they may appear to contain nothing but special pleadings, are perhaps the most instructive as well as admirable portions of the work. Upon all subjects, indeed, the ruling spirit of the author prompted him to search for debated questions, few of which he has left without some sort of settlement of the point in dispute. In this manner he has treated many points in English history, and amongst these the celebrated question as to the authorship of *Eikon Basiliké;* a subject afterwards treated with consummate ability by his illustrious friend and countryman Sir James Mackintosh, and concerning which he proved that, whatever share Charles may have had in the original suggestion or even partial composition of the work, Gauden was the person who had prepared it for the press, and whose claims on this account were afterwards fully and liberally acknowledged.

Mr Laing appears also to have taken a peculiar pleasure in setting at nought local and national prejudices. Exulting in the free exercise of his strong reasoning powers, he scrupled not to attack prevailing opinions, however deeply rooted in the minds and affections of his countrymen, when he conceived that they were founded in error. This characteristic peculiarity is strikingly exemplified in his Dissertation on the authenticity of the Poems ascribed to Ossian. These productions required no depth of argument, no minute investigation of facts, to support their credit amongst an enthusiastic people, much more accessible to the impulses of feeling than the deductions of reason; whilst, on the other hand, those who questioned their genuineness shrunk from directly encountering what they naturally considered as unconquerable prejudices. But Mr Laing was not a man who would either acquiesce in a received opinion as such, or hesitate for an instant to bring it before the tribunal of reason; and, accordingly, he proceeded, without scruple or remorse, to examine the pretensions of Macpherson, on the broad and intelligible principle of an investigation into the facts upon which they were professedly grounded.

The arguments in this Dissertation may be resolved into three great classes or divisions. The first class consists of a logical examination of the arguments and proofs produced, or supposed to have been produced, in favour of the authenticity of the poems ascribed to Ossian, with a vigorous exposition of their errors and fallacies; but, as the author is necessarily obliged to confine himself to mere sceptical arguments, this is perhaps the least interesting and satisfactory part of the investigation. The second class of arguments, embracing those derived from contemporary documents and chronological facts, not only forms that portion of the subject in the treatment of which the extensive reading and discriminating sagacity of the author were most conspicuously displayed, but constitutes a body of evidence which finally demolished every pretence for considering the poems of Ossian as authentic translations of the productions of a Highland bard of the fourth century. The third division of the subject, containing an examination of the internal evidence furnished by the poems themselves, if not the most conclusive part of the inquiry, is certainly that which gives us the highest conception of the author's critical ingenuity, indefatigable industry, and searching spirit of investigation. He produces terms expressive of ideas which could scarcely be supposed or even imagined to have entered into the minds of the early and rude population of the Highlands; he points out similes, and trains of thought, derived or plagiarised from the writings of other authors, particularly from Virgil, Milton, Thomson, and the Book of Psalms; and, finally, he institutes a curious comparison between the method of arranging terms and expressing ideas in the poems of Ossian, and that which is exhibited in a forgotten poem, called *The Highlander*, published in early life by Macpherson,—pointing out many striking coincidences, and clearly establishing, to a certain extent, a complete identity of authorship. In short, the Dissertation, taken as a whole, though strained in some points, and overlaboured in others, presents a body of evidence and argument, which has completely satisfied all impartial persons as to the spuriousness of the pretended translations of Macpherson, and almost reduced the defenders of their authenticity to despair. The onset made by Johnson had proved entirely abortive, because it was a mere sudden ebullition, the offspring of passion and prejudice, rather than of inquiry or examination; but the attack of Laing was of a very different character; and being conducted in a scientific manner, by regular approaches from various points, it ultimately succeeded in demolishing every defence, and in forcing the defenders of Ossian to capitulate at discretion. "I was delighted and instructed by your History," says Dr Parr, in an original letter now before us, "and I sincerely think your remarks on Ossian one of the most able and satisfactory pieces of criticism I ever read; it amounts to demonstration, and does the highest credit to your sagacity and your knowledge."

But the author of this fierce attack upon one of the strongholds of Scottish national pride did not achieve his victory without suitable reprobation. The Highlanders were loud in their wailings, and the public prints teemed with ebullitions of their wrath. All their national feelings were excited into furious activity against the man who had dared to dispute the authenticity of Macpherson's pretended translations, which every Highlander was prepared to receive, with undoubting faith, as the genuine inspirations of Ossian. Mr Laing was regarded as a sort of monster, who, having no bowels of compassion, had set all feelings of patriotism at defiance. To many it seemed an anomaly in human nature, that a Scotchman should thus voluntarily undermine a fabric of national glory; and, unable otherwise to account for such sacrilege, they sought to discover in the author motives of petty rancour, local prejudice, and inconceivable animosity. Mr Laing's Dissertation, however, had the merit of eliciting a report by a committee of the Highland Society of Scotland, "appointed to inquire into the nature and authenticity of the poems of Ossian;" but although the inquiry was conducted under the superintendence of Mr Henry Mackenzie, and brought to light some curious facts previously unknown, it left the question as to the authenticity of Macpherson's pretended translations very much in the same situation in which it originally stood. Meanwhile, Mr Laing brought the controversy to a final issue by publishing a work, entitled the Poems of Ossian, containing the Poetical Works of James Macpherson, in prose and rhyme, with Notes and Illustrations, the nature of which may easily be conceived. This work is in fact a great literary curiosity. Like a victim decked out for immolation, it is conspicuously introduced to the world only to render its destruction the more signal and notorious. About the same time, an attempt was made to answer Mr Laing's argument, by a gentleman of the name of Macdonald; and, two years afterwards, an elaborate work, complacently termed a Confutation, was published by Dr Graham of Aberfoyle, who, however, gave a somewhat unlucky specimen of his qualifications for the task, by quoting, as authority concerning the Celts, the treatise of Tacitus *De Moribus Germanorum*, which refers entirely to the nations of Teutonic origin. Mr Laing did not feel himself called upon to answer an argument based upon such infelicitous and inapplicable authority.

His next work was one which, if possible, occasioned a still greater outpouring of wrath than his Dissertation on the Poems of Ossian. In 1804 he published a new edition of his History, to which he prefixed, in two volumes, a Preliminary Dissertation on the participation of Mary Queen of Scots in the Murder of Darnley. The object of this disquisition is declared in the title; and, throughout the whole detail, the author never for an instant deviates from the conclusion of guilt, which it is the professed purpose of his elaborate induction to establish. This, in fact, is the peculiar manner in which he has almost invariably treated controverted questions. Having first formed his own opinion from analytical investigation, he proceeds at once to establish it by synthetical probation; he arranges his documents and produces his arguments with the precision and conciseness of a practised logician; and, in the treatise in question, he no more hints at the possibility of the queen's innocence, than the crown-lawyer at that of the prisoner against whom he seeks for a verdict of guilty. He goes directly forward to his object, accumulating proofs or presumptions of criminality as he advances, till at length he carries our reason as it were by storm, and compels us, whether we will or not, to acquiesce in the judgment which from the first we had been prepared to hear pronounced. Few who have read this extraordinary production can ever forget the startling exactness with which the arguments are suited to the facts, or the strict accordance of the reasoning with all the details of the murder as given in the narrative of that event submitted to the reader. The reciprocal adaptation is in every respect complete; and hence the whole fabric must be overthrown together, or the joint force and full result of all must be unconditionally admitted. There is no other alternative, no intermediate term; Mr Laing grapples with his subject in such a manner as to render it impossible to withstand the force of his attack except by utterly destroying the assailant.

Hence it has been generally acknowledged that the effect of his reasoning is irresistible. "His inquiry into the controverted question of Mary's participation in the death of Darnley," says Dr Parr, "is minute without tediousness, and acute without sophistry. Whether I consider," adds he, "his sagacity in explaining causes, his clearness in relating facts, his vigour in pourtraying characters, or his ingenuity in unfolding and enforcing principles, I shall ever find reason to lament that the continuation of Hume's History was not undertaken by a writer so eminently qualified as Mr Laing for a work so arduous and important." In referring to the production in question, as one peculiarly characteristic of his genius, a very able writer in the *Edinburgh Review* employs still stronger language. "Mr Laing's merit as a critical inquirer into history, an enlightened collector of materials, and a sagacious judge of evidence," says he, "has never been surpassed. If any man," adds he, "believes the innocence of Queen Mary, after an impartial and dispassionate perusal of Mr Laing's examination of her case, the state of such a man's mind would be a subject worthy of much consideration by a philosophical observer of human nature." Sir James Mackintosh expresses an opinion equally decided, but much more specific and detailed, "I have just finished a careful perusal of your Dissertation on Mary," says he, in a letter to Mr Laing, dated Bombay, 28th of July 1807; "and I think myself bound to profess my shame for having ever doubted the atrocious guilt of that princess. Hume and Robertson are undoubtedly too mild. The original documents themselves cannot be read without conviction. Whoever doubts the genuineness of the long letter from Glasgow, or of Haubert's confession, must either be incorrigibly prejudiced, or altogether unaccustomed to the examination of evidence. If she were tried before me, I should certainly direct a jury to find her guilty. Her adversaries (with the exception of Murray) seem a detestable gang. Only think of the conferences at York and Westminster, in which there were at least two accusers, Lethington and Morton, who were more or less concerned in the murder; for, after all Morton's dying piety, by his own account, while his hands were reeking with Rizzio's blood, he haggles for a written warrant from Mary; he suffers at least the murderous plot to proceed for months, undisturbed by him, to its completion, and he at last acts a principal part in the collusive acquittal of the man whom he knew to be the murderer. Indeed the Scottish court and nation were then little less barbarous, bloody, and perfidious, than Abyssinia in the time of Bruce, though the literature of Buchanan, and the beauty of the unfortunate Mary, throw a little fallacious brilliancy around them."[1]

Besides the works already enumerated, Mr Laing edited *The Historie and Life of King James the Sext*, which was published at Edinburgh in the year 1804, from a copy of the original manuscript which David Crawfurd of Drumsoy, historiographer to Queen Anne, had employed in compiling his Memoirs of the Affairs of Scotland. The occasion of this publication arose out of the exposure made by Mr Laing, in his Historical Dissertation on the Murder of Darnley, of the real character of Crawfurd's work, and his "complete detection of the first of those literary forgeries for which the Scots are still so peculiarly distinguished." This he had announced without reserve in the Dissertation. "It is necessary to observe," says he, "that Crawfurd's Memoirs are a downright forgery, which has introduced much error into the present controversy. Having found a manuscript history of the times, he expunged every passage unfavourable to Mary, inserted every fact or assertion which he found in Camden, Spottiswood, or Melvil, whom he quotes on the margin as collateral authorities; and, after compiling Memoirs of his own, protests, that without wresting the words, he has adhered to the sense and meaning of the original. From Goodall's advertisement to the second edition, it appears that the manuscript was transferred to Mr Hamilton of Wishaw. On making proper inquiry, I had the good fortune to find it among the papers of his descendant, the present Lord Belhaven. From the same advertisement it appears, that Goodall collated Crawfurd's Memoirs, not only with Keith's copy, but with another of the same manuscript in the Advocates' Library;—nor had Goodall the honesty to explain the forgery which he must have perceived, or to state, in a single instance, the discrepancy between the manuscript and the printed Memoirs."[2] These severe strictures naturally provoked criticism, and Mr Laing was soon afterwards induced to publish *The Historie of the Life of King James the Sext*, as contained in the Belhaven manuscript, the avowed prototype of Crawfurd's Memoirs; a publication which he justly regarded not merely as a vindication of himself, but also as an instructive exposure of one of the grossest literary forgeries that have ever been employed to pervert the genuine history of Scotland.[3]

In the year 1805 Mr Laing married Miss Margaret Carnegie, daughter of Mr Thomas Carnegie of Craigo, a most respectable gentleman in Forfarshire, and sister-in-law to his friend Lord Gillies. He continued to reside chiefly in Edinburgh, until 1807, in which year he was chosen member of parliament for Orkney. He was then in a very indifferent state of health; but, during that one session, he occasionally attended his duty in parliament, where, notwithstanding the disadvantages of his manner, he was listened to with much attention and respect. These brief and irregular appearances may be said to comprise his whole career as a legislator; for, although he still continued a member, a serious illness, with which he was now seized, prevented his further attendance in parliament, and thus deprived the country of the services of one who thoroughly understood, and was eminently qualified to advance, its true interests. Whether from excessive study and exertion, or from original debility of constitution, he suffered severely from a nervous disorder, which committed frightful inroads on his already enfeebled frame, and ultimately reduced him to such a state of weakness, that he required to be supported by artificial means to prevent him from fainting. In 1810, his illness still continuing, he went to reside in Orkney, hoping no doubt to derive benefit from breathing his native air. Nor were these hopes altogether disappointed. By the cessation of laborious and exhausting intellectual exertion, and still more perhaps by the absence of excitement, his health was to a certain extent re-established; and as his ever active mind required, as a condition of health, employment of some description, he sought and found it in attention to the primitive occupation of mankind. From this period he devoted himself entirely to agricultural pursuits, in which he displayed his usual zeal, and in which, also, his labours were crowned with success. He farmed with advantage to himself, but certainly with far greater advantage to Orkney, into which he introduced many beneficial improvements, the general adoption of which is chiefly ascribable to his example. But his health, which had so long been infirm, continued to decline till November 1818, when he expired suddenly, without any suspicion having been entertained of the immediate approach of death.

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[1] *Memoirs*, &c. vol. ii. p. 346, 347. "One reflection struck me," adds Sir James, in continuation. "In so small a town as Edinburgh then was, and at so little a court as that of Mary, I think it impossible that all the circumstances of a murder so long conspired, communicated to so many noblemen, and executed by so many of Bothwell's dependents, should not have very soon transpired, and been really known in the whole society, before any formal evidence of them was in existence. The contrivance of a false tale, the forgery of the letters, &c. were, in such circumstances, impossible. Haubert, the queen's valet, was a person of some consequence. The gentlemen who were Bothwell's retainers were still more so. Their confession, if forged, would have been contradicted by witnesses enough. I speak now with some little experience in such matters. I have been three years a criminal judge, and I know what becomes of *secrets* in small societies."

[2] Laing's *History of Scotland*, vol. i. p. 15, note.

[3] Preface to the edition of *The Historie* printed for the Bannatyne Club, pp. xvi. and xvii. "One of the immediate results of this publication (by Mr Laing)," says the learned and ingenious editor, "was the discovery of the Newbattle manuscript, by the late noble Marquess of Lothian, who, with that liberality of spirit which in him was native and indelible, did not lose a moment in communicating his discovery to Mr Laing; and, in 1806, Mr Laing, with his characteristic promptitude and zeal, had made preparations for printing the continuation of the work which this manuscript put into his possession, together with the corrections on his previous publication which it had enabled him to make. From this object, however, he was afterwards diverted by other more important pursuits; and it is now (1825) only, for the first time, that the entire History and Life of King James the Sixth has been given to the public." (Preface, *ubi supra.*)

Mr Laing was personally much esteemed, and, as an historian, greatly admired by Mr Fox, whose acquaintance he appears to have made some time in the year 1804. In a note prefixed to an interleaved copy of the first edition of the History of Scotland, containing Dr Parr's corrections, and dated on Good Friday 1803, the doctor says, "Mr Fox is a great admirer of your work, and he is also *puri sermonis amator*. I wish you were acquainted. As a critic, he is quite as captious and fastidious in protecting English idiom from Scottish invasion as I am." It would appear that not long afterwards the wish here expressed was realized. Mr Fox not only admired Mr Laing's work, but emphatically pronounced it a "treasure;" opening, as he said, new sources of interesting information; presenting new views of important transactions; and constituting a valuable acquisition to all who desire to obtain a true knowledge of the history of the nation of which it treats. The correspondence which passed between these distinguished individuals still remains unpublished, though it would no doubt form a very interesting addition to our stock of epistolary information respecting the history of the period to which it relates. During the time that Mr Laing represented his native county in parliament, and was permitted by the state of his health to attend to his parliamentary duties, he gave an active and zealous support to the short administration of his illustrious friend, of whose character and principles he was an ardent and devoted admirer.

The severity of Mr Laing's manner, the uncompromising nature of his opinions, the inflexible sternness of his principles, and the keen controversial character of his writings, all united to raise up against him a numerous host of adversaries, who but too often endeavoured to conceal their deficiency in knowledge and in argument by the bitterness of their scurrility, or the virulence of their abuse; but, in his private capacity, he appears to have had no enemies. On the contrary, he was much esteemed and beloved by his personal friends, all of whom that still survive agree in describing him as a single-hearted, upright, and truly honest man, who, to the courage necessary for asserting any truth however dangerous, or combating any prejudice however inveterate, added a higher and rarer endowment, namely, the magnanimity of acknowledging and correcting an error when it was distinctly shown to be such. He loved truth for its own sake; and though he delighted to discuss controverted questions both in history and in letters, he never contended for victory like a vulgar disputant, but only sought, by the honest means of research and reasoning, to disencumber such questions of the errors and fallacies with which he conceived them to have been overgrown, and to set before the world the uncorrupted truth in its native simplicity and purity. That his judgments were sometimes harsh, and his censure often unsparing, when the occasion seemed scarcely to require any great display of severity, is what his admirers have never denied nor attempted to conceal; but, on the other hand, it is proper to keep in view, that strong convictions naturally give birth to strong expressions, and that a mind at once actuated by the love of truth, rectitude, and liberty, and by an innate abhorrence of falsehood, iniquity, and oppression, could scarcely be expected, in surveying some of the darkest and blackest portions of our annals, to refrain from giving utterance to that moral indignation which every lover of freedom and of virtue must feel in contemplating the abuse of law, justice, religion, humanity, and government, for the purpose of enslaving and oppressing a whole people. Finally, to Mr Laing, more perhaps than to any other historian or critic of his country, belongs the undoubted merit of having cleared away much rubbish, removed much prejudice, refuted numerous and grave errors, detected not a few impostures, and, generally, placed both the characters and events of that portion of our national history of which he treats, in a clearer and more satisfactory light than he found them.

(See Parr's *Works*, edited by Dr Johnstone, vol. viii.; Field's *Memoirs of the Life, Writings, and Opinions of Dr Parr*, in two vols.; Pinkerton's *Literary Correspondence*, in two vols.; Original Letters of Dr Parr to Mr Laing; *Edinburgh Review*, vol. xliv. p. 37; *The Historie and Life of King James the Sext*, edited by Mr Laing, Edinburgh, 1804, in 8vo; *The Historie and Life of James the Sext*, with a short continuation to the year 1617, from the Newbattle Manuscript, printed for the Bannatyne Club, with a preface by the Vice-President, Mr Thomas Thomson, Edinburgh, 1825, in 4to; Laing's *History* and other Works, *passim*.) (A.)

LAIRESSE, Gerard, an eminent Flemish painter, born at Liege in 1640. He wrote an excellent book on the art, which was translated into English, and printed at London, both in 4to and 8vo.

LAIS, a celebrated courtezan, daughter of Timandra, born at Hycara in Sicily. It is said that she first began to sell her favours at Corinth for ten thousand drachmas. This gave rise to the proverb, *Non cuivis homini contigit adire Corinthum*. The success which her gallantries met with at Corinth encouraged her to pass into Thessaly, and more particularly to enjoy the company of a favourite youth called Hippostratus. She was, however, disappointed. The women of the place, jealous of her charms, and apprehensive of her corrupting the fidelity of their husbands, assassinated her in the temple of Venus, about 340 years before the Christian era. Some suppose that there were two persons of this name, a mother and her daughter.

LAITY, the people as distinguished from the clergy. The lay part of his majesty's subjects is divided into three distinct states; the civil, the military, and the naval.

LAKE, an extensive accumulation of water, wholly surrounded by land, and having no direct nor immediate communication with the ocean or with any seas, or having so only by means of rivers. Lakes are of various kinds, and have been divided into two classes, according to their situation and causes of production. Those which are formed in deep hollows between the ridges or at the bases of mountains, and which are supplied with water by springs or torrents, are classed together; and those which are formed in low and level countries by the surplus water of rivers, or from a want of sufficient declivity in the ground to allow the waters to continue their course, constitute a second class. But there are several other characteristics belonging to lakes, which justify a more minute division; and four distinct kinds have been recognised. The first class comprehends those which have no issue, and into which no running water flows. These, being generally diminutive in size, do not merit much attention. Some of them, as the Arendt, in Vieille Marche, are formed by the sinking down of the circumjacent lands; others, like the Lake Albano, near Rome, appear to be old volcanic craters filled with water. The second class consists of those lakes which discharge, but receive no running water. These are formed by springs, which, rising in a hollow place or reservoir, fill it before they find an outlet for their own waters. These lakes, however, are fed by small, almost invisible, streams, which descend from contiguous heights, or from subterraneous canals. Lakes of this description are often the source of large rivers, and they are naturally situated on great elevations. There is one of this kind on Mount Rotando, in Corsica, which is 9294 feet above the level of the sea. The third class, consisting of lakes which receive and discharge streams of water, is very numerous. Each of these lakes may be considered as a large basin or reservoir for receiving the accumulated waters of the neighbouring countries. They have in general only one opening, which almost always takes its name from the principal river which flows into it. These rivers are sometimes said to traverse the lakes; but this is scarcely correct, as their waters mingle with those of the basin over which they are diffused. These lakes have often sources of their own, either near the borders, or in their bottom. There are four or five lakes of this class in North America, which in magnitude resemble seas, but which preserve their clearness and sweetness notwithstanding, by the flow of a continual stream of fresh water. Sometimes a chain of lakes are connected with one another and with the ocean, by a series of rivers. This is the case with the great lakes on the northern frontier of North America, where basin succeeds basin on a lower level, like so many locks of a canal. A fourth class of lakes are those which receive streams of water, and often great rivers, without having apparently any outlet. These lakes are in general confined to warm climates; but the Caspian Sea, the largest of all lakes, belongs to this class. (See the article on the Caspian Sea.) There are a great many others besides in Asia; and South America contains the Lake Titicaca, which has no efflux, although it receives very considerable rivers into it. Such lakes appear to belong to the interior of great continents; they are placed on elevated plains, which have no sensible declivity towards the sea, and which do not allow of the water opening for itself a passage through which to flow out. It was long conjectured, that, by some subterraneous channel, lakes of this description communicated with the sea; but the fact that the surfaces of some of the most remarkable of them, such as the Caspian and the Dead Sea, are depressed below the level of the ocean, is quite sufficient to explode this hypothesis. For were there any communication, however small, the ocean would flow into the lake till it brought it to a level with itself. The true explanation seems to be, that a quantity of water equal to that which runs in is carried off by evaporation. The absorption of liquid by the contiguous land may also materially assist in carrying off the surplus fluid. There is another class of lakes, which differ materially from any of the preceding, namely, those which are contained in cavities quite covered over by earthy strata. These are probably very numerous, for it frequently happens, that after any violent convulsion of the globe, such as an earthquake, they become exposed to view; and, by the operations of mining, digging of wells, and the like, they have often been met with. Some of them appear to be the source of rivers, whilst others are known to receive very considerable streams, which lose themselves in the interior. Such are the numerous cavities of the Julian Alps. Certain lakes situated above ground periodically disappear; and their waters, it is most probable, flow into similar reservoirs. That very extensive subterranean cavities exist, is sufficiently attested by numerous phenomena. The disappearance of rivers, the waters thrown up by volcanoes, the sudden and terrible inundation of mines, the mountains which are suddenly engulphed in the bosom of lakes, and the springs of fresh water which spout up in the midst of the ocean, are all so many evidences of the fact. There is a district in the interior of Algiers, where the inhabitants, after digging to a depth of about two hundred fathoms, invariably come to water, which flows up in such abundance that they call it the subterranean sea.

The physical phenomena which certain lakes present are very remarkable, and were calculated to excite astonishment in an age when the operation of natural causes was not sufficiently attended to. Periodical lakes are the most common. Those which are formed by excessive rains, and which are evaporated by solar influence, are sometimes of great magnitude, as in tropical climates, where they cover spaces of several hundred leagues in length and breadth. Towards the poles they shrink into mere pools, scarcely worthy of notice. But there are lakes entirely independent of the rainy season, which appear and disappear at certain intervals, although these changes do not seem to take place at regular intervals. With regard to such sheets of water, Malte-Brun observes: "If there exist now in the numerous cavities of the earth subterraneous lakes of this kind, and if these communicate with other lakes which are visible, it is easy to imagine that the waters of these last may sometimes entirely disappear, by sinking down into the basin of the subterraneous lakes in proportion as they dry up. This lower basin again filling itself anew, the waters issue from it to fill the superior basin. If, in a supposable series of subterraneous cavities, the last link of the chain happen to be a mass of subterraneous water, situated at an elevated level in the bosom of a mountain, the periodical return of the waters in the visible basin may be accompanied by a motion similar to that of the spouting fountains. It is by means of such hydraulic machinery that nature keeps up the wonders of the lake of Cirknitz in Illyria, and in many others of the same description."

There are some lakes which present very remarkable phenomena, such as rising and falling like a tide, and boiling, and becoming agitated even during serene weather. Some of the Scottish lakes, and the Welter in Sweden, often experience violent commotion when the atmosphere is perfectly still. It seems highly probable that these agitations are connected with earthquakes in distant countries; and a coincidence in dates on certain occasions has given countenance to this belief. In Portugal there is a small lake or pool near Beja in Alemtejo, which emits a loud noise on the approach of a storm. Other lakes appear agitated by the disengagement of subterranean gases, or by winds which blow in some cavern with which the lake communicates. Near Boleslaw, in Bohemia, there is a lake of unfathomable depth, which sometimes in winter emits blasts of wind so strong as to elevate to some height ponderous pieces of ice. In the Marche of Brandeburg, the pool of Krestin often commences in fine weather to boil up in whirlpools, so as to engulph small fishing boats.

With regard to depth, lakes vary infinitely. In those situated in mountainous districts, it is remarkably great; that of Lochness, in Scotland, is one hundred and thirty fathoms in some parts. The general depth of the Caspian Sea is from sixty to seventy fathoms; but this increases towards the southern end to such a degree that no bottom can be found with a line of three hundred and eighty fathoms. The lake of Geneva attains the great depth of one hundred and sixty-one fathoms, and there are many others known to be exceedingly deep, without the amount being exactly ascertained. Several have passed for ages amongst the vulgar as bottomless; but this opinion, it is scarcely necessary to say, is unworthy of credit. Yet we are not to reckon as fabulous the accounts of lakes with double bottoms, which are said to be found in Sweden and elsewhere. This phenomenon is supposed to arise from interwoven roots becoming incrusted, and, being suspended near the bottom of a lake, rise and fall according to circumstances, thus causing the depth to vary in appearance In regard to the temperature of lakes, see the article Climate.

Distinct from any of the characteristics of lakes yet alluded to, is the chemical nature of their waters. Lakes, in respect to the quality of the waters, are distinguished into fresh, saline, and alkaline. Those which receive and discharge considerable quantities of fresh water are almost always kept themselves in a state of perfect freshness; but those which have no outlet are invariably saline. Thus the Dead Sea, whose waters have no efflux, and into which the river Jordan continually flows, contains about eight times as much salt as common sea-water. The waters of the Jordan are brackish, and the neighbouring soil is much impregnated with salt, so that the accumulation of such a quantity of saline matter in the lake, during a series of ages, is by no means surprising, for none of it ever passes off by evaporation. Salt must likewise be accumulating in beds at its bottom; for as soon as water is perfectly saturated, and can hold no more salt in solution, the latter must fall to the bottom. Some of the large Asiatic lakes are dried up during summer, and their beds appear lined with an incrustation of salt. All the great American lakes consist of fresh water; those of Europe are either fresh or slightly saline; but the Caspian Sea, and various others which are situated in plains full of salt, or in tracts of country where salt springs abound, are almost invariably impregnated with that substance. Some lakes are both saline and alkaline, as is the case with the Natron Lakes in Lower Egypt. They derive their appellation from their abounding in soda, which is there called *trona* and *natron*, the nitre of the Scriptures. Some lakes produce a pitchy substance. In the island of Trinidad there is one, on the surface of which an enormous quantity of bitumen, fit for naval purposes, is collected. Deposits of various kinds, besides those enumerated, seem to owe their origin to lakes. Bog iron-ore, or hydro-phosphate of iron, is often found in such situations as to show that it has been deposited from the waters of lakes; and in some countries it is collected from the sides and bottoms of lakes once in a certain number of years. Calcareous springs are numerous, and when the waters of these collect in a hollow place, so as to form a lake, quantities of calcareous sinters and tuffas are deposited, so that the lakes when emptied present extensive deposits of that mineral. The travertine employed at Rome for building is a lake or spring calcareous deposit of sinter and tuffa.

From the great changes which have been taking place for a series of ages, the number, the extent, and the situation of lakes must have from time to time been materially altered. That they occupied a greater extent of the earth's surface formerly than they do now, is quite consistent with geological phenomena. But the investigation of the subject belongs more properly to Geology, which see under the head of MINERALOGY. (R. R. R.)

LAKE, or *Lacque*, a preparation of different substances, which are formed into a kind of magistery for the use of painters. One of the finest and first invented of these was that of *gum lacca* or *lacque*, from which all the rest, as made by the same process, are called by the common name *lacques*. See LACCA.

LALANDE, JOSEPH JEROME LEFRANÇAIS DE, a most zealous and accomplished astronomer, born at Bourg en Bresse, on the 11th of July 1732, was the son of Peter Lefrançais, and Marianne Mouchinet, his wife.

His parents were in easy circumstances, and his education being somewhat too indulgent, the natural quickness and impetuosity of his temper was too little restrained. His earliest taste, like that of most other children, seems to have been for romantic tales; and he was fond of making little stories with such materials as he possessed, but their subject was chiefly religious. He was in the habit of living much with the Jesuits, and he imbibed from them a predilection for the pulpit. At the age of ten he used to amuse himself with making sermons, and preaching them to a select congregation. The comet of 1744, however, with its long tail, took more forcible possession of his imagination, and he watched it with the most unremitting attention. Having been sent to Lyons to continue his studies under the Jesuits there, he acquired a taste for poetry and eloquence, and was then inclined to devote himself to literature and to the bar; but an eclipse of the sun recalled his attention to astronomy. His parents wished him to follow the profession of magistrate, and with that view sent him to Paris; but he accidentally lodged in a hotel where Delisle had established an observatory, and this circumstance led him to become acquainted with that professor, and to attend his lectures. These lectures were by no means popular; and the want of a more numerous audience made it easy for the professor to accommodate his instructions to the fixed attention and rapid progress of his new pupil, who became singularly attached to his master, and to all the methods which he employed. Lalande attended, however, at the same time, the physico-mathematical lectures of Lemonnier, who was more in credit as a teacher, and who also took great pains for his improvement.

In the mean time he had completed his legal studies, and at the age of eighteen he was called to the bar as an advocate. His family was anxious for his return to Bourg; but just at that time Lemonnier obtained leave to nominate him as a substitute for himself on an astronomical mission to Berlin, where he was to make observations on the lunar parallax, corresponding with those which Lacaille was sent to the Cape to obtain. He was favourably received by Maupertuis, who introduced him to Frederic and his court; and was made a member of the Academy of Sciences at Berlin, when he was about nineteen.

He remained a year in that city, observing at night, and passing his mornings in the study of the integral calculus, under Euler's directions; and his evenings in the society of Voltaire, Maupertuis, D'Argens, and other men of talents. It was not likely that his intercourse with such persons would confirm the principles which he had imbibed from the Jesuits; his moral conduct, however, does not appear to have been influenced by his change of sentiments. After his return to Bourg, he pleaded a few causes to oblige his friends; but the success of his operations at Berlin obtained him speedily a place in the Academy of Sciences at Paris; for, in 1753, before he was twenty-one, he was chosen to fill up a vacancy in the department of astronomy, which had been open for some years. He soon afterwards offended his friend Lemonnier, by rejecting too harshly an unfounded objection of that astronomer to his method of computing the effect of the earth's ellipticity on the lunar parallax, which differed from Euler's formula. Lacaille, who drew up the report of a committee appointed on the occasion, decided in Lalande's favour; but Lemonnier remained dissatisfied, and would not see him for twenty years. He had some similar discussions, at a later period, with Duséjour, who was a little too severe in criticizing some of his approximations, as if they had been intended to be rigidly accurate; but their personal friendship remained unaltered.

For more than fifty years he continued to be a constant and voluminous contributor to the Memoirs of the Parisian Academy, as well as to other scientific collections. His investigations were always judiciously directed to the advancement of astronomy; but they can scarcely ever be said to have exhibited any marked features of talent, or of address, beyond what might be expected from the industry of a man of good ordinary abilities, confining himself almost entirely to one subject. He was always anxious to call the public attention to astronomy as a science, and to himself as an individual. Thus, on occasion of the transits of Venus in 1761 and 1769, he addressed a circular letter to most of the governments of Europe, on the importance of obtaining a multiplicity of collateral observations; and he received in reply several invitations from sovereigns whose countries were more favourably situated for the purpose than France, to come and make the observations in person. He thought it unnecessary, however, to leave Paris on the occasion. He contented himself with being the first to announce to the public the result of the most satisfactory comparisons; and his countrymen seemed to give him almost the whole credit of every thing that had been done by others in conformity with his suggestions. He was much mortified, however, in not receiving from Father Hell an account of the observations made at Wardhus; and he was afterwards greatly inclined to dispute their accuracy, because Hell made the parallax smaller than he did by $\frac{1}{5}$th of a second; whilst the mean of both results, which is 8, 6″, agrees extremely well with the most modern computations; but, in the end, he did justice to the importance of Hell's observations.

He was constantly in the habit of passing a few months every year with his family in the country, and he occasionally amused himself, in the course of these visits, with mineralogical excursions, and with chemical studies. He delivered, about the year 1758, an oration before a public assembly at Lyons, on the advantage of monarchy above every other form of government; he even adhered to a similar opinion, and expressed it openly, in times when nothing but his celebrity, as a man devoted exclusively to science, could have made it safe for him to declare it.

After having published the astronomical tables of Halley, he felt the necessity of a new collection, and determined to begin with those of Mercury, which he found the most imperfect. He pursued, for this purpose, a regular course of observations at the Palais Royal, where he used to go before sunrise, in the winter mornings, to see the planet in the twilight. Having occasion to refer to the observations recorded by Ptolemy, he found it necessary to refresh his acquaintance with the Greek language, which he had in some measure neglected. But, with all his labour and diligence, his tables of Mercury exhibited, in 1786, an error of forty minutes in the time of a transit. The circumstance mortified him extremely; but it led to a revision of the tables, and he afterwards succeeded in making them much more perfect. It must be recollected, that, in the time of Hevelius, a transit was anxiously expected for four whole days before it occurred.

He next undertook to improve the tables of Mars and Venus. His tables of these planets were, on the whole, less accurate than those of Mercury, though more exempt from great occasional errors. He had computed their perturbations in the Memoirs of the Academy, but he never thought it worth while to compare his formulas with observation. The irregularities of Jupiter and Saturn were much more discouraging; he was obliged to confine himself, in discussing them, to the most modern observations; and he did not appear sufficiently to appreciate the empirical equations of Lambert, though they greatly diminished the errors of Halley's tables.

When Maraldi had given up the management of the *Connaissance des Tems*, Lalande and Pingré were candidates for the appointment. Lalande succeeded in obtaining it; but he had the modesty to confess that the work would have been more accurately performed by Pingré, if his connection with the church had not, according to the rules of the academy, incapacitated him for the situation. He made the work, however, much more popular, as a miscellaneous publication, than Pingré was likely to have done; and he was less prejudiced than Pingré in the choice of his tables. He remained editor of the work from 1760 to 1775; it was conducted by Jeaurat from 1776 to 1787, and from 1788 to 1793 by Méchain. Lalande then undertook it once more, Méchain being engaged in some measurements with Delambre, and the academy having been abolished, and its members dispersed.

Lalande had been disposed to call in question the assertion of Newton and of Voltaire, that no comet could possibly come into contact with the earth; and he had proved that the effect of perturbations at least rendered their reasonings somewhat inconclusive. A short memoir on the subject, which was to have been read at a public sitting of the academy, was accidentally omitted, as not very important, from the pressure of other business. This circumstance alarmed the sensibility of the public of Paris, who fancied that Lalande had foretold some dreadful catastrophe, which the government was afraid to announce; and when the memoir was published, they insisted that its contents had been modified, to lessen the alarm. Duséjour made some objections to the author's reasoning; but the whole affair was soon forgotten.

A memoir on the length of the year was honoured with a prize by the academy at Copenhagen. Delambre, however, thinks the determination not so good as the earlier one of Lacaille, though much better than Mayer's, which was more commonly adopted. Lalande took great pains also with the subject of the sun's rotation, employing in his computations of the places of the spots an easy approximation, instead of Duséjour's more laborious methods; but being careful to compare with each other the most distant observations of the same spot. From the existence of this rotation he thought it reasonable to infer that the sun had also most probably a progressive motion, which would naturally be produced by any single impulse capable of occasioning a rotation. He had some discussions with Dr Maskelyne respecting the mode of computing the equation of time, in which Maskelyne appears to have had the advantage.

In the year 1762, Delisle resigned in his favour the professorship of astronomy in the College de France, which he kept for nearly forty-six years. He allowed the most attentive of his pupils to board with him at a cheap rate, doing his utmost on all occasions to promote their success in their studies and in life. Thus he brought forward Méchain and Dagelet, and afterwards his own nephew, who completed, with so much diligence and accuracy, the Description of the Heavens, which he had himself projected, and which had been begun by Dagelet before his unfortunate expedition. He was made a fellow of the Royal Society of London in 1763.

His health was generally good, though his constitution was delicate. He had an attack of jaundice in 1767, which was attributed to intense application; but he completely recovered from its effects by an attention to diet, and by the use of horse exercise. He then intended to leave all his property to the academy; but he afterwards gave up his family estates to his relations, and lived on his appointments only, refraining from all kinds of luxuries, in order to be the more able to do acts of liberality to his friends, whom he always sought to oblige in the most delicate manner, and often without making his services known. He had a pension from Russia in the time of the Empress Catherine; it was suspended by Paul, but restored in 1805 by Alexander.

He was not particularly successful as an observer, but used to refer to the works of his contemporaries, Bradley and Lacaille, though not exactly, according to the expression of one of his biographers, "as Ptolemy had done to those of Hipparchus;" for Hipparchus must have been dead two centuries before Ptolemy was born. On the occasion of the disappearance of the ring of Saturn in 1774, he went to Béziers, in order to profit by the superior serenity of the air there, the climate of that country being supposed to be the best in France; but his observations were less valuable than others made at Paris and in London.

In the year 1798, he undertook an astronomical expedition to Gotha. He had once meditated an aerostatical voyage there; but his companion took care that their dangers should terminate in the Bois de Boulogne. He was received with much interest at Gotha by an assembly of astronomers that was collected from different parts of Germany. The object of the congress was perhaps not unmixed with personal vanity; but it had no political design to promote, unless the general adoption of the new French measures could be considered as a political object. Lalande was by no means a revolutionist; he was sufficiently free from any prejudices of education; but he openly condemned the political opinions of the day; and, in 1792, he even exposed himself to great personal danger in order to save the life of Dupont de Némours, after the 10th of August; and he was equally useful to some of the clergy, whom he concealed in the buildings of the Observatory at Mazarin College, making them pass for astronomers. He had also the courage to publish accounts of Lavoisier and Bailly, a short time after their deaths.

The attentions of the German astronomers gave him sincere pleasure. He was at all times extremely sensible to compliments, and even to flattery, though very regardless of satire. He used to call himself a sponge for praise, and an oil-cloth for censure. He professedly believed himself endowed with all the virtues, modesty not excepted. He was so fond of notoriety that he once undertook to exhibit the variations of the light of Algol to the public of Paris on the Pont Neuf; but the police interfered, thinking it right to prevent a disorderly assemblage.

Though Lalande can only be classed in the second rank as an inventive astronomer, or a mathematician, he certainly stands in the first as a professor and a popular writer. His methods of calculation have in most instances been already superseded by others more convenient or more exact; those which related to particular phenomena for want of sufficient precision, and those which were more general for want of being readily applicable, without continual repetition, to a sufficient number of concurring observations. It has been observed, that he may perhaps have been often too zealous in the pursuit of his favourite objects; but that, if he had possessed more circumspection, and less vivacity of character, he would have been more exempt from criticism, yet would have rendered less important services to science and to mankind.

His last illness was of a consumptive nature, and he seems to have accelerated its termination by attempting too much to harden himself. He died on the 4th of April 1807, nearly seventy-five years old, and in the perfect possession of his faculties. His last words, when he dismissed his attendants to rest, were, "I have need of nothing more," and in a few minutes he was dead. Had he survived a few hours, he would have received a letter from Dr Olbers, announcing the discovery of a new planet, for which that distinguished astronomer afterwards received the fourth prize medal upon the institution founded by Lalande in 1802, for the most important astronomical discovery made in the course of the year.

Of his voluminous and diversified publications a simple enumeration of the subjects will perhaps be thought too long for perusal, though not improper for insertion in a work which ought to comprehend a complete literary history or bibliography of the sciences.

1. We find, in the *Memoirs of the Parisian Academy of Sciences* for 1751, an account of his Observations at Berlin, which also appears in the *Memoirs of Berlin* for 1749, and a Latin translation in the *Acta Eruditorum* for August 1752. 2, 3. 1752–53, An Essay on the Lunar Parallax. 4. 1754, A Transit of Mercury. 5. Elements of Mars. 6. 1755, Longitude of Berlin. 7. Lunar Eclipse. 8. 1756, Transit of Mercury. 9. Lunar Parallax continued. 10. 1757, Observations at the Luxembourg. 11. Transit of Venus. 12. Secular Equations and Mean Motions. 13. A Gnomonical Problem. 14. Meridian Altitudes. 15. 1758, Perturbations of Mars by Jupiter. 16. Motions of the Planetary Nodes. 17. Change of Latitudes of the Stars. 18. 1759, Comet of 1682 and 1759. 19. 1760, Sun's Diameter. 20. Perturbation of Venus by the Earth. 21. Eclipse of 1760. 22. 1761, Solar Parallax. 23. Interpolation. 24. Transit of Venus Observed. 25. Solar Parallax. 26. Transit Computed. 27. Observed at Tobolsk. 28. In Denmark. 29. Compasses, and the Variation. 30. Perturbation of Mars by the Earth. 31. Planetary Nodes. 32. 1762, Equation of Time. 33. Obliquity of the Ecliptic. 34. Horary Motion in Transits. 35. Nodes of Jupiter's Satellites. 36. Diameter of Venus. 37. Comet of 1762. 38. 1763, Eclipses of Jupiter's Satellites. 39. Solar Eclipses for a Spheroid. 40. Triangles, Rectilinear and Spherical. 41. 1764, Transit of 1769. 42. Lunar Libration. 43. 1765, Motion of Saturn. 44. Eclipses of Jupiter's Satellites. 45. The Third Satellite. 46, 47. 1766, Theory of Mercury. 50. 1768, Opposition of Jupiter. 51. Transit of 1769. 52. Orbit of Saturn. 53. 1769, Lunar Observations. 54. Comet of 1769. 55. Transit of Venus. 56. A Solar Eclipse. 57. Transit of Venus. 58, 59, 60. Comparisons of Observations. 61. 1770, Solar Parallax. 62. Sun's Diameter. 63. Appearances in the Transit. 64. Chappe's Observation. 65. 1771, Theory of Mercury. 66. Astronomical Observations. 67. Solar Parallax. 68. 1772, Transit of Venus. 69. Tides. 70. 1773, Comets. 71. Saturn's Ring. 72. 1774, An Opposition of Saturn. 73. Saturn's Ring. 74. Disappearance of the Ring, at Beziers. 75. 1775, Opposition of Mars. 76. Elements of Mars. 77. Same Latitudes and Longitudes. 78. Opposition of Jupiter and Saturn. 79. An Eclipse of Saturn. 80. 1776, Spots and Rotation of the Sun. 81. 1777, Observations at Paris and Madrid. 82. An Observation of Mercury. 83. Longitude of Padua. 84. The Solar Spots, continued. 85. 1779, Third Satellite of Jupiter. 86. Theory of Venus. 87. Herschel. 88. 1780, Obliquity of the Ecliptic. 89. Precession of the Equinoxes. 90. Fourth Satellite of Jupiter. 91. 1782, Duration of the Year. 92. A Transit of Mercury. 93. 1783, An Eclipse of the Sun. 94. Inclination of the Orbits. 95. 1784, Elements of Jupiter. 96. Ellipticity of the Earth. 97. 1785, Motion of Venus. 98. 1786, Secular Equations of the Sun and Moon. 99. Mass of Venus. 100. Equation of Mars. 101. Mars in Quadrature. 102. Orbit of Saturn. 103. Theory of Mercury, fifth Memoir. 104. Satellites of Jupiter. 105. Fifth of Saturn. 106. 1787, Fernel's Measurement. 107. Herschel's. 108. Jupiter's Third Satellite. 109. Conjunction of Venus. 110. Motion of Saturn. 111. Inclination of Saturn. 112. Answer to Lemonnier, on Lunar Observations. 113. Solar Eclipses of 1787. 114. Eclipse of 1666. 115. Caspian Sea. 116. 1787, Eclipse of 1765. 117. 1788, Eclipses applied to Longitudes. 118. Conjunction of Venus. 119. Lunar Parallax, fourth Memoir. 120. Moon's Diameter. 121. Jupiter's Fourth Satellite. 122. Satellites of Saturn. 123. Light of Algol. 124. Height of the Seine. 125. 1789, Epacts. 126. Observations of 8000 Stars, first Part. 127. Motion of Venus. 128. Astronomical Observations. 129. Observation of Mercury. 130. Tides. 131. Catalogue of Stars, second Part. 132. 1790, Disappearance of Saturn's Ring. 133. Interior of Africa. 134. *Mém. Inst.* i. 1798, Orbit of Mercury. 135. ii. 1797, Occultations of Aldebaran. 136. Solar Eclipse of 1706. 137. Solar Eclipse of 1748. 138.

v. 1803, Zodiac at Strasburg. 139. Eclipses calculated. 140. Opposition of Mars. 141, 142. Motion of Venus. 143. Motion of Mercury. 144. vi. 1806, A Transit of Mercury.

145. The earliest of his separate publications appear to have been two little volumes, intended for provincial circulation only, entitled Etrennes Historiques, 24. Par. 1755–56. 146. Another little article of his miscellaneous works was a Discours qui a remporté le Prix de l'Academie de Marseille en 1757, Mars. 1757. The subject was the spirit of justice, as tending to the glory and the stability of a government. 147. We have then Three Letters on Platina, *Jour. des Sav.* 1758, Jan. Jun. 1760, Feb. 148. Letter on a new Sun Dial, *Jour. Sav.* Jun. 1758, ii. 439; the lines being invisible when the sun does not shine.

149. Tables Astronomiques de Halley, 2 vols. 8. Paris, 1759. Containing several new tables, and an elaborate history of the comet of 1759, of which the author had computed the perturbations, according to the theory of Clairaut. 150. Connaissance des Tems, 16 vols. 8vo, Par. 1760–1775; 14 vols. 1794–1807. This work contains, besides, the Ephemeris, an important selection of the most useful astronomical papers. On one occasion, for temporary reasons, these papers were published in a separate volume. 151. Exposition du Calcul Astronomique, 8. Paris, 1762; a companion to the almanac.

152. Oraison funèbre de Maurice Comte de Saxe, 8. Par. 1760. 153. Art du Papetier, f. Par. 1761. 154. Parcheminier, 1762. 155. Cartonnier, 1764. 156. Chamoiseur, 1764. 157. Tanneur, 1764. 158. Mégissier, 1765. 159. Maroquinier, 1766. 160. Hengroyeur, 1766. 161. Corroyeur, 1767.

163. Letter on Delisle's Calculations, *Journ. Sav.* Apr. 1761. 164–5. In the 52d volume of the Philosophical Transactions for 1761 and 1762, we find several papers of Lalande; two on the transit of Venus; 166. one on Norwood's Measurement of the Earth; 167. An Account of a Comet; and, 168. An Account of Occultations of the Fixed Stars by the Moon. 169. In the Transactions for 1769, another paper on the Transit of Venus.

170. Discours sur la Douceur, 1763. This essay was intended as a sort of exercise for the author's own moral improvement; and he made it a rule to read it over every year, in order to assist him in commanding his temper. He may possibly have derived some little advantage from the practice, but he never acquired enough of self-command to refrain from wounding the feelings of another, by any pointed remark that might suddenly occur to him.

171. Astronomie, 2 v. 4. Paris, 1764; 3 v. 1771, 1792; vol. iv. 1780, not reprinted. This compilation far excelled in utility all former works of the kind, and will always be considered as exhibiting the most perfect picture of the science, such as it existed from 1760 to 1790, with all the details of practice and computation. Lemonnier called it, with some truth, the great newspaper of astronomy. The Treatise on the Tides, which constitutes the fourth volume, is chiefly a collection of observations, not sufficient even for the basis of a complete theory: an abstract of it may be found in the *Mém. Acad.* Dijon, ii. 1774. 172. Figure du Passage de Venus de 1769, Paris, 1764; together with an explanatory memoir. 173. On the Equation of Time, *Recueil pour les Astronomes*, 1765.

174. He undertook the mathematical department of the Journal des Savans, from 1766. 175. On the Coins of Piedmont, *Journ. Sav.* Dec. 1767. 176. Voyage d'un François en Italie, 8 vols. 12mo: a correct guide and faithful repertory for travellers, containing some scientific information, besides maps of the principal cities. 177. Dissertation sur la Cause de l'Elévation des Liqueurs dans les Tubes capillaires, 8. Par. 1770. 178. A Dictionary of Astronomy, in the *Encyclopédie d'Yverdun*, 56 v. 4. 1770–6. 179. Abrégé d'Astronomie, 8. Par. 1773, 1795; translated into various languages. 180. Notes on the Mondes Primitifs of Fontenelle, 24. Paris; often reprinted. 181. Notes on Bouguer's Traité de Navigation. 182. Mémoire sur le Passage de Venus, 4. Par. 1773; with a life of Dr Bevis. 183. Réflexions sur les Comètes qui peuvent approcher de la terre, 8. Par. 1773. 184. Lettre à Cassini sur l'Anneau de Saturne, 8. Toulouse, 1773; a violent attack, which was speedily suppressed by the author. 185. Ephemerides, 3 vols. vii. viii. ix. Paris, 1774, 1792. This was a continuation of Lacaille's computations, containing also some detached articles of importance; for instance, Hampstead's Catalogue, in the eighth volume. 186. A Celestial twelve-inch Globe, Paris, 1775.

187. The astronomical articles in the Supplement of the Old Encyclopédie, about 1776; those of D'Alembert, in the body of the work, having been little more than extracts from Lemonnier. 188. To the Encyclopédie Méthodique Lalande contributed a Dictionary of Astronomy, making about one third of the Mathématiques, 3 vols. 4to. They were principally extracted from his own astronomy; and the article Cadran, which is very elaborate, was originally intended for a fifth volume of that work.

189. Traité des Cannaux de Navigation, f. Paris, 1778. This volume is principally descriptive, especially of the Canal of Languedoc. 190. Letter on the Variation of the Compass, as connected with the Temperature of the Earth, *Journ. Sav.* 1780. Sept. 191. Leçons d'Astronomie de Lacaille, 8. Par. 1780; with some Notes. 192. Astronomie, in *Bibliothèque des Dames*, 12. Par. 1786, 1795.

193. Letter on the name of the planet Herschel, *Journ. Sav.* 1789; objecting to "Uranus." 194. Déscription d'une Machine de M. Ramsden, 4. Paris, 1790; the dividing engine, translated. 195. Account of nine Lalandes, *Journ. Sav.* Nov. 1791. 196. Journey to Manheim in 1791, *Journ. Sav.* 1791. 197. On the Zodiac at Strasburg, *Journ. Sav.* 1791.

198. Abrégé de Navigation, 4. Paris, 1793; with a full catalogue of works relating to the subject, and many useful tables. 199. A Journey to Mont Blanc, performed in 1796, *Mag. Encycl.* ii. iv. 433. 200. Histoire Céleste Française, i. 4. Par. 1801; containing the catalogue of stars begun by Dagelet, and continued by Michel Lefrançais Lalande, the nephew of the editor. 201. Continuation of Montucla's *Histoire des Mathématiques*, 2. v. 4. Par. 1802; making the third and fourth of that elaborate work, but not equally well digested and discussed with the original part. 202. Tables de Logarithmes, 18. Par. 1802. 203. Four Memoirs on Ceres, *Journ. Phys.* 1802. 204. Some articles in the *Necrologie des Hommes Célèbres*. He wrote, at different times, Accounts of the Lives of Vicq d'Azyr, Delisle, Commerson, Verron, Me. Lepaute, and Dubocage; and he had undertaken a life of Bucholz, a short time before he died. Commerson had complimented him by making a genus Lalandia, transgressing in his favour the classical canon of the botanists, to reserve such honours for the reward of merit in their own department.

205. Bibliographie Astronomique, 4. Paris, 1803; with a history of the Progress of Astronomy from 1781 to 1802. This useful volume was printed at the public expense, under the auspices of François de Neufchateau. The author possessed a very extensive collection of astronomical books, and it has been regretted that he did not insert a more complete account of some of the most rare; but the work is already sufficiently voluminous. Some other productions are attributed to him in the *Dictionnaire des Anonymes;* but they would probably have added little to his fame had they been acknowledged.

(Delambre, *Mém. Inst.* viii. 1807. H. P. 30; and Biographie Universelle, xxiii. 8vo, Paris, 1819. Ma. C. de Salm, *Magas. Encycl.* 1810, ii. p. 288; including a sketch by himself, written in 1804.) (L. L.)

LAMA is the name of the sovereign pontiff, or rather god, of the Asiatic Tartars. He is never to be seen but in a secret place of his palace, amidst a great number of lamps, sitting cross-legged upon a cushion, and adorned all over with gold and precious stones; and at a distance his worshippers prostrate themselves before him, it being unlawful for any to kiss even his feet. He is called the *great lama*, or *lama of lamas*, that is, priest of priests. The orthodox opinion is, that when the grand lama dies, either of old age or infirmity, his soul in fact only quits a crazy habitation to look for another younger or better; and it is discovered again in the body of some child, by certain tokens known only to the lamas or priests, in which order he always appears.

LAMANON, Robert Paul, a celebrated naturalist, was born at Salon, in Provence, in the year 1752, being descended of a respectable family. He was destined for the church, and sent to Paris to study divinity; but the acquaintance of philosophers having induced him to relinquish theological pursuits, he turned his attention to chemistry and mineralogy. Yet he afterwards became a canon in the church; but the death of his father and elder brother caused him to resign an office to which he was never attached, and he now possessed the power of directing his own future exertions. One amiable trait in the character of Lamanon is worthy of notice, and that is, that he refused to accept of his paternal inheritance except as an equal sharer with his brothers and sisters. When offered a considerable sum to resign his office of canon in favour of a certain individual, he replied, "The chapter of Arles did not sell me my benefice; I shall therefore restore it in the same manner that I received it." Anxious to remove the veil which conceals the secrets of nature from mortal eyes, he travelled through Provence and Dauphiné, and scaled the Alps and Pyrenees. He reached the summit of rocks, and explored the abysses of caverns, weighed the air, analysed specimens, in short considered himself as qualified to form a new system of this world. After a time he returned to Paris, and thence proceeded to England; and although he was in imminent danger of being overwhelmed by the ungovernable fury of the waves, he ordered himself to be tied to the mainmast, that he might be enabled to contemplate more at leisure this grand and terrific spectacle. Instead of being dismayed, he was transported with the tremendous roar of thunder, the vivid flashes of lightning, and the glancing spray with which he was almost incessantly covered; and, in his own estimation, this was the most exquisite day which he had ever enjoyed. During the time which Lamanon afterwards spent at Paris, he became one of the founders of the Museum. Having resolved to revisit Switzerland and Italy, he went first to Turin, where he joined himself to the learned of that country. From Piedmont he proceeded to Italy, returning by the way of Switzerland, where he explored the Alps, and ascended to the top of Mont Blanc; and on his return to Provence with the spoils of the countries which he had visited, he arranged the interesting fruits of his journey. Whilst Lamanon was preparing for the press his work on the Theory of the Earth, the French government conceived the design of completing the discoveries of Captain Cook, and the Academy of Sciences was charged with the selection of men qualified to rectify our notions of the southern hemisphere. Condorcet therefore made choice of Lamanon for advancing the progress of natural history connected with this great enterprise, and he received the invitation of that philosopher with the most eager transport. He set out for Paris, refused the salary offered him, took leave of his friends, and went directly for Brest. The armament, under the command of the justly celebrated but unfortunate La Perouse, set sail on the 1st of August 1785; and having reached the island of Maouna, Lamanon went ashore with the crew of two boats, where he fell a sacrifice to the fury of the savages, bravely fighting in his own defence to the last.

LAMAY, an island in the Eastern Seas, five or six miles in circuit. It is four leagues distant from Formosa, and is inhabited and cultivated. Lat. 22. 22. N.

LAMB, in *Zoology*, the young of the sheep kind. See MAMMALIA.

Scythian LAMB, a kind of moss, which grows about the roots of fern in some of the northern parts of Europe and Asia, and sometimes assumes the form of a quadruped, so called from a supposed resemblance in shape to that animal. It has something like four feet, and its body is covered with a kind of down. Sir Hans Sloane read a memoir upon this plant before the Royal Society, for which those who think it worth while may consult the *Transactions* (No. 245, p. 461.) Mr Bell of Antermony, in his very instructive "Account of a Journey from St Petersburg to Ispahan," informs us that he searched in vain for this plant in the neighbourhood of Astrakan, and that the more sensible and experienced amongst the Tartars treated the whole history as fabulous.

LAMB, *Charles*, a distinguished essayist and critic, was born in the Temple, London, on the 11th of February 1775. He was presented to the school of Christ Hospital in 1782, some recollections of which place he afterwards embodied in one of his most delightful essays. In November 1789, having completed the usual period allotted for education at that seminary, he returned to the home of his mother, who still resided in the Temple, although his father was now no more. At first he was employed for a short time in the South Sea House with his brother; a graphic and admirable account of which establishment he afterwards gave, in an essay of the same name. On the 5th of April 1793, he obtained an appointment in the accountant's department of the India House, where he remained till 1825, when he was allowed to retire on a handsome pension. The events of his life of a domestic nature are of little moment, and need not detain us in sketching his literary career. His first appearance as an author was in a small volume of poetry, published by his friend Coleridge in 1797, to which he contributed various pieces. A few years afterwards appeared "Old Blind Margaret, and Rosamund Gray," a tale of great simplicity, sweetness, and pathos. In 1802 he published "John Woodvil, a tragedy," alongst with "Fragments of Burton," one of his favourite authors. "Mr H———," a farce, was acted at Drury Lane in 1806, without success. It is, however, probably the best dramatic *jeu d'esprit* in the language; but it wants plot and incident for the stage, and its jokes are too intellectual to be appreciated by a mixed audience. In 1808 appeared his "Specimens of English Dramatic Poets who lived about the time of Shakspeare, with Notes," chiefly critical. In the year 1811 he contributed to the "Reflector" a series of admirable prose papers, including those on Hogarth's pictures and the tragedies of Shakspeare. The most celebrated of all Mr Lamb's works, the "Essays of Elia," were published in various periodicals between the years 1820 and 1833; and were subsequently collected and given to the public in two octavo volumes. In 1830 appeared his small volume of poems called "Album Verses," which also contained "The Wife's Trial," a dramatic poem, founded on Crabbe's "Tale of the Confidante." In conjunction with his sister, he also compiled three very popular books for children, namely, "Mrs Leicester's School, or the History of several young Ladies, related by themselves;" Tales from Shakspeare;" and "The Adventures of Ulysses." He

Lamballe.

likewise wrote another farce called "The Pawnbroker's Daughter, or the Reprieved Man," founded on his amusing paper, "On the Inconveniences of being hanged;" and to several periodical works he contributed various criticisms on the drama and the fine arts. His volume bearing the title of "The last Essays of Elia" appeared in 1833; and its publication he did not long survive, having died on the 27th of December 1834.

In depth of thought and splendour of genius, Charles Lamb was surpassed by several of his contemporaries; but as an essayist, he is entitled to a place beside Rabelais, Montaigne, Sir Thomas Browne, Steele, and Addison. He unites many of the characteristics of these several writers. He has refined wit, exquisite humour, a genuine and cordial vein of pleasantry, and heart-touching pathos. In the latter quality his Rosamund Gray will stand a comparison with any piece of the kind that ever was written. His fancy as an essayist is distinguished by great delicacy and tenderness; and even his conceits are embued with human feeling and passion. He had an extreme partiality for our earlier prose writers, particularly for Fuller, Sir Thomas Browne, and Burton, as well as for the dramatists of Shakspeare's time; and the care with which he studied them is apparent in all he ever wrote. It shines out conspicuously in his style, which has an antique air, and is redolent of the peculiarities of the seventeenth century. Its quaintness has subjected the author to the charge of affectation, but there is nothing really affected in his writings. His style is not so much an imitation, as a reflection, of the older writers; for in spirit he made himself their contemporary. A confirmed habit of studying them in preference to modern literature, had made their style natural to him; and long experience had rendered it not only easy and familiar, but habitual. It was not a masquerade dress he wore, but the costume which showed the man to most advantage. With thought and meaning, often profound, though clothed in simple language, every sentence of his essays is pregnant; and in this respect he bears a strong resemblance to the writers alluded to. If he had their manner, he possessed their spirit likewise. To some of his essays and specimens we are considerably indebted for the revival of the dramatic writers of the Shakspearian age; for he preceded Gifford and others in wiping the dust of ages from these admirable writers. In his brief comments on each specimen, he displays exquisite powers of discrimination. His discernment of the true meaning of the writer is almost infallible. He seizes with unerring precision the proper point of view from which the piece ought to be seen; and this led him with equal success to detail the real centre, whether a character or an event, round which the orb of the drama revolved. His penetrating intellect enabled him to throw more and newer light on the true meaning of some of the great masterpieces of the theatre than any other man. The perfect unison of the style of his annotations with the text which they illustrate, also constitutes a great charm, if not a leading merit. As a poet, Mr Lamb is not entitled to a very high place. Like his prose works, his poetical pieces are written in an antique style, so completely identical with that of Beaumont and Fletcher, Johnson, and others of that era, that they might pass current for genuine specimens of these great writers. In private life Mr Lamb was extremely amiable, and his house was a great resort for wits and men of letters; for, in wit and shrewdness of observation, his conversation was considered as equal to his writings.

LAMBALLE, a city of France, in the department of the Northern Coast, and arrondissement of St Brieux. It stands on the river Gnoseion, on one of the most fertile spots of the district, and contains 3900 inhabitants, who make linen goods, leather, but especially the best parchment. Long. 2. 41. W. Lat. 48. 28. N.

Lambecius.

LAMBECIUS, or Lambeck, Peter, one of the first bibliographers of Germany, was born at Hamburg, on the 13th of April 1628. He was the son of Heino Lambeck, a good arithmetician, who published several works, and of a sister of Lucas Holstein, called in Latin Holstenius. After he had completed his early studies, his uncle counselled him to visit the most celebrated schools, and generously undertook to bear the expense of his travels. He set out from Hamburg at the close of the year 1645, and stopped some time at Amsterdam, where he attended the prelections of Vossius and of Baerle, to whom his uncle had recommended him. He then visited Leyden, and other principal cities in the Low Countries; after which he proceeded to Paris, where he resided a year with Cardinal Barberini, who, out of consideration for Holstenius, showed him every attention, and introduced him to many of the most learned men of the time. At length, in 1647, he rejoined his uncle at Rome. Holstenius received him in the kindest manner; but he soon had occasion to appreciate the character of his nephew, which exhibited a singular mixture of pride and baseness, and, at the end of two years, they separated in mutual dislike. Lambecius quitted Rome in 1649, studied law for a short period at Toulouse, and then revisited Paris, where he occupied himself in collecting materials for his history of Hamburg, to which place he returned in 1651. Some time after his return to his own country, he was appointed professor of history in the college of Hamburg, and commenced his prelections by a discourse *De Historiarum cum cæteris Studiis conjunctione*, which confirmed the favourable opinion that had been formed of his talents. In 1659, he succeeded Joachim Jungius in the rectorship, and, by his zeal for the prosperity of the school, proved himself worthy of this promotion. But his religious principles began to be suspected; and as it seems certain that, during his travels, he had secretly abjured Lutheranism, he became exposed to every species of annoyance in consequence. Sensible that he could not preserve his situation, and desirous to make some provision for the future, he married an old maid whom he believed to be wealthy; but finding himself deceived, he fled from Hamburg, fifteen days after this ridiculous marriage, with the resolution never again to return thither. He took his departure upon the 14th of April 1662, and proceeded to Vienna, where he met with a flattering reception from the Emperor Leopold, to whom he had the honour of presenting his first work, being the *Prodromus Historiæ Literariæ*. In May he left Vienna for Italy, and, on reaching Venice, sent to the senate of Hamburg a formal resignation of his appointments as rector and professor. On his arrival at Rome, he introduced himself to Christina, queen of Sweden, who kindly endeavoured to console him for the persecutions he had experienced at the hands of the Protestant theologians. He there also solemnly abjured the errors in which he had been educated, and returned to Vienna, which he reached in the month of September. The emperor immediately conferred on him the title of historiographer, with the situation of sub-librarian; and some months afterwards, on the demise of Mathias Manchter, he became principal keeper of the imperial library. He immediately set about arranging in the best order the vast collection confided to his care; he removed the manuscripts from an obscure corner, where they had been abandoned to neglect and decay, classed them, and commenced a catalogue of this part of the collection. He made two journeys, one to Innspruck, and another to Baden, whence he brought back a large quantity of rare books and manuscripts, with which he enriched the imperial library, to which his own was afterwards added. Lambecius, being naturally frugal, lodged with an advocate named Strellmayer, who managed all his affairs, and whom, in return, he made his heir. He died at Vienna in the month of April 1680, at the very time when he was preparing to prosecute his labours with the greatest vigour. His works are, 1. Prodromus Lucubrationum criticarum in A. Gellii Noctes Atticas, Paris, 1647, in 8vo; 2. Animadversiones ad Codini Origines Constantinopolitanas, Paris, 1655, in folio; 3. Origines Hamburgenses, sive rerum Hamburgensium libri duo, Hamburg, 1652–1661, in two vols. 4to; 4. Prodromus Historiæ Literariæ, ibid. 1659, in folio; 5. a Collection of Discourses pronounced in the Gymnasium of Hamburg; 6. Commentarii de Augustissima Bibliotheca Cæsarea Vindobonensi, Vienna, 1665–1679, in eight vols. folio. Bayle has devoted to Lambecius an article in his Dictionary, and Niceron has inserted the life of this bibliographer in his *Mémoires*. (A.)

LAMBERT of Aschaffenburg, a Benedictine monk, of the eleventh century, who wrote several works, amongst which is a History of Germany from the year 1050 to 1077.

LAMBERT, JOHN, was born on the 7th September 1619, in the parish of Kirkby-Malhamdale, in the west riding of Yorkshire, at Calton Hall, the seat of a family of which he was the representative, and which traced its descent from a daughter of the Conqueror. That his father died when he was thirteen years of age, that he married, when in his twenty-first year, a daughter of Sir William Lister, his neighbour, and that he studied the law in an inn of court, but never pursued it as a profession, is all that we find recorded of his early years. He first participated in political measures, as one of those who signed the address to the king, of the 13th of May 1642, in answer to his demand of a guard of horse from the county of York. He also signed a declaration and protest against raising troops and money, in preparation for the ominous struggle which was then commencing. He also attended the great meeting on Heworth Moor, on the 3d of June, when a petition was presented by Sir Thomas Fairfax, which Charles refused to accept. In August the royal standard was raised, and the civil war was begun; and, in September, Lambert commenced his military career as captain in the parliamentary forces, under Lord Fairfax, who commanded them in the north. In the following year we find him bearing the rank of colonel: and the earliest exploits in which he is known to have distinguished himself, were a sally from Hull on the 11th of October 1642, by which he obliged Lord Newcastle to raise the siege; an engagement at Bradford on the 5th of March 1644, wherein he defeated Colonel Bellasis; and the pursuit of this officer and his troops to Selby, which, being joined by Lord Fairfax, he stormed and took on the 11th of April. The siege of York by the combined forces of Lords Fairfax, Manchester, and Leven ensued; and, on the 2d of July, the eventful fight of Marston Moor. Here Lambert and Sir Thomas Fairfax were the two officers by whom the right wing of the parliamentary forces, consisting of cavalry, was commanded. Opposed to it was the cavalry commanded by Prince Rupert, which Lambert and Fairfax charged and broke; but were carried too far by the ardour of pursuit. Lambert appears to have shown much bravery in this action, but others were more instrumental in its important issue. The siege of York was recommenced by the victorious army, and Lambert was sent in to a parley with the governor, which ended in the surrender of that city. Upon the resignation of Lord Essex in January 1645, and the appointment of Fairfax to succeed him as commander-in-chief of the parliamentary forces, Lambert was appointed commissary-general of the northern army, and ordered to take charge of the forces in Yorkshire in the absence of Fairfax. Under Lambert's command, during 1645, the royalists were beaten in two skirmishes, at Keighley and Ferrybridge; and the garrisons of Scarborough, Pomfret, Sandall, Sherborne, Bolton, and Skipton, surrendered to the parliament. In the commencement of 1646 we find Lambert engaged under Fairfax in the west, in subduing the last remnants of the royalist forces in that quarter: we find him at the sieges of Dartmouth, of Truro, and of Exeter, which surrendered, the first on the 20th of January, the second on the 14th of March, and the last on the 9th of April; after which he marched with the army to the siege of Oxford, and was one of the commissioners who conducted the negotiation which ended in the surrender of that important city, of which, by the parliament, he was appointed governor. He was afterwards made one of a select council of five (his colleagues being Cromwell, Ireton, Fleetwood, and Whitelocke), to consult on the disposal of the parliamentary forces for the reduction of the few garrisons which still maintained the authority of the king. These were the principal military services which Lambert is recorded to have rendered to his party during the first civil war. In the struggles for ascendancy between the parliament and the army in 1647, Lambert took a prominent part, and was an able advocate of the cause of the latter. In the declarations published on the part of the army, "Colonel Ireton," says Whitelocke, "was chiefly employed, or took upon him the business of the pen; and having been bred in the Middle Temple, and learned some grounds of the law of England, and being of a working and laborious brain and fancy, he set himself much upon these businesses, and was therein encouraged and assisted by Lieutenant-General Cromwell, his father-in-law, and by Colonel Lambert, who had likewise studied in the Inns of Court, and was of a subtle and working brain." He was one of the commissioners who, on the 2d of July, attended at High Wycombe, to treat with commissioners from the parliament, and prepared the proposals for the settlement of the kingdom, which they submitted to the parliamentary commissioners at Colnbrooke, on the 3d of August; proposals which insisted neither on the abolition of episcopacy nor the punishment of the royalists, and which contained terms more favourable to regal power than those to which Charles afterwards acceded in the Isle of Wight.

After delivery of these proposals, Lambert was sent into Yorkshire as major-general of the four northern counties. In 1648 the civil war again broke out, and his military talents were again exerted. He defeated Langdale and Musgrave near Carlisle, whilst awaiting a junction with the Scotch army under the Duke of Hamilton, which was about to invade England. The junction, however, could not be prevented; and Lambert, much inferior in strength to the combined armies, was obliged to await the arrival of Cromwell before he hazarded an action. When reinforced by Cromwell in August, the parliamentary forces were scarcely more than 8000 men, whilst those of Hamilton and Langdale were 20,000. But availing themselves of the detached position of the allied forces, the parliamentary generals attacked them successively, and put each army utterly to rout; and Hamilton, who with the remnant of his forces fled towards the south, was pursued by Lambert and his cavalry to Uttoxeter in Staffordshire, where, having in his progress dispersed and beaten the scattered portion of the Scotch army, Lambert forced its commander to surrender. He then followed Cromwell into Scotland, where they were received cordially by Argyll's party; and Lambert, after remaining awhile at Edinburgh at Argyll's request when Cromwell had returned, and having received thanks for his good services from the committee of estates, marched back into England to reduce Pomfret, a strong fortress which the royalists had seized anew. Before this place he arrived in December 1648, and here he remained till after the trial and execution of Charles; events in which he bore no part, and of which we have no evidence of his having approved. Pomfret surrendered soon afterwards; and the parliament, on receiving this intelligence in March 1649, voted thanks to him, and a grant of lands out of the demesnes of Pomfret, of the value of L.300 a year, "in respect of his many great and eminent services, performed with much care, courage, and fidelity, as well against the Scots army as against the forces of Sir Marmaduke Langdale, and in reducing the castle of Pomfret, being the last garrison in England held out against the parliament, and in respect of his extraordinary charges therein, he having not been allowed any pay as a major-general." When the parliament found it expedient to appoint some person to command in Ireland, Sir William Waller was supported by the Presbyterian party, and Lambert, whom Clarendon calls "the second man in the army" (Cromwell being the first) was preferred by the Independents. Both, however, waived their pretensions in favour of Cromwell, who was consequently appointed to the government of Ireland, and soon afterwards, upon the resignation of Fairfax, to the post of commander-in-chief of all the parliamentary forces. Lambert was at the same time made second in command; and the two generals, in June 1650, marched towards Scotland, where Charles II., who had been acknowledged in that portion of his dominions, was at the head of a numerous force, hoping by its aid to subdue the remainder. Lambert, in a gallant but indecisive action near Musselburgh, was wounded, his horse killed, and himself for a while in the hands of the enemy, but was rescued by his troops. Nothing decisive occurred till the memorable battle of Dunbar, in which Lambert led the van, and eminently contributed to the successful issue of that important action; which was followed by the occupation of Edinburgh and Leith, and the surrender of the castle of Edinburgh in the course of the winter. No further advantage was obtained till the summer of 1651, when, in the month of July, Lambert defeated above 4000 of the king's troops at North Ferry, and obtained minor successes in the course of the same month at Inchgarvey and Burntisland. The parliamentary generals had not been careful to keep between the king and the English frontier; and, profiting by their oversight, Charles, immediately after these actions, embraced the bold resolution of marching into England, and passed through Carlisle on the 5th of August, at the head of 16,000 men. Leaving Monk before Stirling with 7000 men to reduce that fortress, Cromwell and Lambert hastened in pursuit of Charles; and it was the duty peculiarly assigned to Lambert to hover with his cavalry round the royalist army, and harass and divert its progress, whilst Cromwell pursued a more direct route southward, in order to interpose between the king's army and the capital. Lambert, though with a far inferior force, engaged the royal army at Warrington; but the country, being much enclosed, was unfavourable for his cavalry, and he retired to Knutsford Heath, where he could act with more effect. The king, however, rightly judging that it was Lambert's policy to disturb the march of the royalist forces, was unwilling to attack him, and passed on towards Worcester. Lambert, instead of pursuing him further, attended Cromwell's summons for a general rendezvous of the parliamentary forces at Warwick. From thence the combined forces, amounting to about 30,000 men, marched to Worcester, where, on the 3d of September, the anniversary of the battle of Dunbar, occurred that important conflict which reduced Charles from the leader of a mighty host to the condition of a proscribed, disguised, and solitary fugitive. Lambert behaved with skill and gallantry in this battle, in which he was much exposed, and had his horse shot under him. He bore as large a share of the honours of success as could fairly be ascribed to a second in command, where Cromwell was the chief; and the gratitude of the parliament was promptly shown, on the sixth day after the battle, by a resolution "that lands of inheritance in Scotland, to the yearly value of L.1000 sterling, be settled upon Major-general Lambert and his heirs, for his great and eminent services for this commonwealth;" and it was ordered that both of his regiments should continue on the English establishment. In the winter of this year, Lambert was made a commissioner, together with Monk, Vane, St John, and four others, for the settlement of affairs in Scotland, where he remained a very short time, being, on the death of Ireton, appointed by the parliament, in January 1652, to succeed him as lord-deputy of Ireland. But the term of this office was limited to six months, and Lambert, filled with displeasure against the parliament (a displeasure which Cromwell artfully fomented), resigned the proffered post; upon which Fleetwood, who had married Ireton's widow, the daughter of Cromwell, was appointed in his stead. Lambert appears to have been amongst those who were most favourable to the assumption of supreme power by Cromwell, and whose influence chiefly contributed to elevate him to the situation of protector. He was the leading person in a general council of officers convened to deliberate on the settlement of the kingdom; he was one of a select committee deputed by that council to prepare the ground and conditions of a plan; he participated in framing the *instrument of government*, presented it to the council, and urged its acceptance; and he bore a prominent part in the installation of Cromwell as lord-protector. As president of the council, he came forward to declare the dissolution of the parliament (called Barebone's), and the adoption of the plan of government prepared by the council; and invited Cromwell to undertake the office of chief magistrate under this constitution; upon which Cromwell, "having heard the instrument of government read, and taken the oath as directed in the close of the said instrument, Major-general Lambert, kneeling, presented him with a sword in the scabbard, representing the civil sword, which Cromwell accepting, put off his own, intimating thereby that he would no longer rule by the military sword."

Lambert sat as member for the west-riding of Yorkshire in the new parliament, which met on the 3d of September 1654. He appears to have been an active member of the legislature, being named on almost all committees, and frequently a teller in divisions; but his share in debate is not recorded, except on one important occasion, where he acted in a manner which appears unquestionably disinterested. It was debated in a committee of the whole house, on the act of settlement, whether the office of protector should be *hereditary* or *elective;* and Lambert, on whom, after Cromwell's death, the office would be most likely to fall, spoke strongly in favour of its being made hereditary.

In the parliament which was convened in 1656, Lambert was again member for the west-riding of Yorkshire, and exerted himself to maintain that form of government, in the constitution of which he had been principally concerned. He vehemently opposed the proposal of investing Cromwell with the title of king; and though the offer of that title was carried in the obsequious parliament, the opposition of Lambert, and the murmurs of the army, with which he had much influence, made Cromwell feel that it was prudent to decline it. He had at one time resolved to accept the title; upon learning which, Lambert, Fleetwood, and Desborough, declared to him, in their own names and those of others, that in that event they must resign their commissions, and sever themselves from his councils and service for ever. Cromwell consequently refused the title, but accepted all those other attributes of royalty with which he was invested, on his second inauguration, of the 12th of May 1657. Lambert, disgusted with these inordinate assumptions of power, refused to take the oath of fidelity to the protector; gave up his commissions, which brought him an income of six thousand pounds per annum; and retired on a pension of L.2000. Lambert took no prominent part in political events until after the death of Cromwell, the succession of Richard, and the meeting of a new parliament in January 1659, in which Lambert was elected for Aldborough and Pomfret, and took his seat for the latter.

He was one of an opposition characterized as "republicans," amongst whom were Vane, Hazlerig, Ludlow, and Fairfax; a body small in number, but formidable from their ability, activity, and union. The first important measure debated was the bill of recognition for establishing Richard in his office, in which, though the protectorists succeeded, Lambert's party obtained a resolution, that, previous to its commitment, "the house should declare such additional clauses to be part of it, as should bind the power of the chief magistrate, and fully secure the rights and privileges of parliament, and the liberties and rights of the people." The acknowledgment of the House of Lords as constituted by Oliver was next debated, and warmly opposed by Lambert and his party, who, though unable to succeed, in consequence of the union in this instance of the protector's friends with the concealed royalists, rendered the recognition much less full than had been contended for by the court party. Meanwhile, Lambert, with Fleetwood and other leaders of the army, had begun to meet at Fleetwood's residence, Wallingford House, where they held council how to subvert Richard, and to uphold what they called "the good old cause." A struggle ensued between the army and the parliament now become Richard's sole support. The Commons, on the 18th of April, carried a resolution that there shall be no council of officers during the sitting of parliament, without permission of the protector and of the houses; and, on the 21st of that month, the command of the army was vested in the three estates, to be exercised by the protector. This brought the struggle to a crisis. Richard was peremptorily told by Desborough that the parliament must be dissolved; and he accordingly dissolved it on the following day. From this time Richard's power had departed, and the country for a while was without a government. The army was the predominant power, and Lambert was its real leader; for Fleetwood, the nominal commander-in-chief, was too vacillating for such emergencies. But the army leaders felt that it was dangerous to attempt to govern without some semblance of civil administration; so the members of the long parliament, excluded by Cromwell in 1653, were invited to assemble; and this remnant, ridiculed under the name of "the Rump," met as a parliament on the 7th of May. Order was for a while restored; but the royalists were encouraged, by the state of the country, to make a bold effort for the restoration of Charles; and Lambert's military prowess was again required in August for the suppression of a rising in Cheshire under the command of Sir George Booth. Lambert obtained a complete and easy victory at Nantwich, in reward for which service the parliament voted him L.1000. But the parliament feared Lambert's power and probable ambition, his influence in the army, and the control of his more powerful mind over the wavering Fleetwood; and, on a petition having been presented from the army in his favour, the effect of which would have been to give to Fleetwood the nominal command, and to Lambert the real power (as was formerly the case under Fairfax and Cromwell), Hazlerig, suspecting Lambert to be the instigator, rashly moved that he should be sent to the Tower. This motion, and the votes hostile to the power of the army, produced a breach, which Hazlerig rashly made irreparable, by attempting to deprive Fleetwood, Lambert, and other leaders of the army, of their commissions. Upon this, Lambert, with Cromwell's example before his eyes, dissolved the parliament by military force; and the supreme authority again devolved on the military council at Wallingford House. The people murmured at their sway; and Monk commenced his celebrated march from Scotland, with the professed intention of restoring the power of the parliament. Lambert, with a view to subdue or win this formidable opponent, proceeded northward, at the head of 7000 men, having previously exacted a promise from Fleetwood that he would not, without his concurrence, make any terms with Charles II. or with Hazlerig. But when arrived at Newcastle, Lambert allowed himself to be overreached by the subtlety of Monk, who amused him with negotiations, of which the real object was delay, whilst Monk was strengthening his force by recruiting in the north, and events were favouring his views in the south. There the power of the military council was crumbling away in the absence of Lambert, and under the feeble administration of Fleetwood, who resigned his commission on the 26th of December. The ejected members resumed their authority; and one of their first acts was to disband Lambert's forces, and order him to return to his own house. Desertion had thinned his ranks; to resist was useless; he obeyed, and being thought too dangerous and powerful to remain at liberty, was soon afterwards committed to the Tower. In April, when Monk had almost withdrawn the mask, and appeared the restorer rather of monarchy than of that "good old cause," as it was termed, to which many had believed him friendly, the republicans again turned their eyes towards Lambert. Apprized of their wishes, he escaped from the Tower, and after lying hid a short time in the city, he hastened into Warwickshire, where, on the 13th of April, he placed himself at the head of six troops of horse and several companies of foot. He was opposed near Daventry, on the 21st, by an equal force, under the command of Ingoldsby. His soldiers refused to fight; and, without a blow being struck, Lambert, the idol of the army, was compelled to surrender, and was again committed to prison.

After the restoration of Charles II. Lambert, though not a regicide, was excepted out of the bill of indemnity. But the Lords and Commons of the convention parliament concurred in a petition, that if he shall be attainted, execution as to his life might be remitted; to which petition the king assented. The succeeding parliament, less mercifully disposed, pressed urgently that he and Vane should be brought to trial, which was accordingly done on the 4th of June 1662, when Lambert was arraigned in the Court of King's Bench, for levying war against the king. His demeanour was meek, and is represented by some as having been deficient in manliness. But an absence of useless bravado is surely an insufficient ground for attributing cowardice to one whose whole previous career had incontestably proved his courage. Lambert was found guilty, and received judgment of death; but his punishment was commuted to imprisonment for life in the island of Guernsey. There he seems to have been mildly treated. It appears, from the warrant-book in the State-paper office, that in November 1662 a warrant was issued to the governor of Guernsey for permitting Lambert to have the liberty of the whole island. That this was afterwards withdrawn (though at what time and for what reason is not known), may be inferred from another warrant of March 12, 1664, directing that Lambert should have his *former* liberty. A letter, hitherto unpublished, is extant in the Bodleian Library; it is from Lambert to the Chancellor Clarendon, dated 27th April, and probably in the year 1664, from which it appears that he owed this favourable treatment to the good offices of that minister. The following extracts, whilst they declare this fact, also display the grateful and contented spirit of the writer:—"Here, my Lorde, give me leave (seeing I believe it cannot be unwelcome to you to know the happie effects of what yo^{r} Lo^{pp} has beene so industrious to procure) to acquaint yo^{r} Lo^{pp} that my L^{d} Hatton (since his arrival here) has beene pleased to give a great alaye to my affections, by assuring mee that I still live under those gratious reflections his Ma^{tie} was once pleased to cast upon mee." "And here, my Lord, againe I beg y^{r} patience while I acquaint you that my Lord has not only poured this oyle into my bones, but has confirmed and improved it by a most frendly and candid deportment towards mee, so as his Maty's late orders of grace were dispensed to mee wth as liberal a hand as I can expect, so as in truth I find it rather difficult to finde what is fit to aske then to obtaine." Lambert remained in Guernsey till his death, which occurred about thirty years afterwards. The favourite pursuits of this tranquil remainder of his active life were botany and painting. It does not appear that he devoted any part of it to literature, or left any record of the great events in which he had been engaged.

Lambert's abilities as a military man were great. In this capacity he was second only to Cromwell, and was, next to him, the idol of the army. As a politician he was less eminent; and though greatly superior to the vacillating Fleetwood, he wanted that union of caution and boldness which enabled Cromwell to surmount all difficulties. That he failed to stem the tide of returning attachment to monarchy is not imputable as a proof of deficiency in political skill, since it may be questioned whether even Cromwell, had he lived, would have been able ultimately to counteract it. A want of caution was the fault which made him at length a victim to the subtlety of Monk. He appears to have been of a mild and amiable disposition, and to have exhibited more of refinement and a courteous bearing than was common amongst his associates. His ambition appears to have been not of an inordinate and reckless kind, but mingled with traits of generosity and disinterestedness. His career was unsullied with crimes against humanity. In troubled times he long held the second place of power, and for a short period the supreme authority, without being chargeable with any act which reflects discredit on his moral character. Though the last and most formidable opponent of the restoration, he seems to have been regarded by the royalists with a degree of good will which was not extended to his inferior associates. He was not one of those master-minds which seem to direct the course of events. He belongs to that secondary class, who display ability in execution rather than in direction. Amongst such, Lambert is entitled to a high place; and he may ever be considered as a very able, and in some respects an estimable man.

(See Whittaker's *History of Craven;* May's *History of the Parliament;* Whitelock's *Memorials;* Ludlow's *Memoirs;* Clarendon's *History of the Rebellion, and Life of himself;* Rushworth's *Collections; State Trials.*) (Y. Y.)

LAMBERT, *John Henry*, a natural and moral philosopher of great talent and originality, born on the 29th of August 1728, at Mülhausen, in Upper Alsace, was the son of a French refugee in a very humble station, and one of a numerous family.

His early studies were only assisted by the instruction he obtained at a small free school in his native town. His father, who was a tailor, could scarcely even afford him leisure from mechanical labour. He was obliged to read and write in the night; and, in order to procure candles, he made little drawings for sale, while he was watching the cradle of his infant sisters. Having learned to write a good hand, he obtained some employment as a copying clerk in the chancery of the town, which he gave up when he was only fifteen, upon being appointed book-keeper at some iron-works in the neighbourhood. At seventeen he became secretary to a Doctor Iselin, who was the editor of a newspaper at Bâle, and who became his firm friend through life. He had now time to render himself familiar with the works of Wolf, Locke, and Malebranche, to which he was in a great measure indebted for the correct logical method that he ever afterwards followed in his researches; having, however, confirmed and improved it by the study of the mathematics, to which he devoted himself with great zeal, and which, after all, constitutes the best practical school of genuine logic.

In 1748, he removed to Coire, having been recommended by Iselin, as private tutor to the family of the president, Count Peter de Salis, whom he undertook to instruct in history and religion, as well as in languages and science. The library of his patron was extensive; he profited by it in all its departments; and his residence at the house of an accomplished statesman, frequented as it was by the best-informed persons of different countries, and with different pursuits, could not but greatly contribute to the extension of his knowledge, and the improvement of his taste. He even amused himself with some poetical exercises in various languages, which must, at least, have been of advantage to his style in prose. He felt the importance of his literary and scientific pursuits to himself and to the world; and in 1752 he determined to keep a journal of all his studies, which he continued throughout his life. He began to publish a variety of fugitive pieces, on different subjects, in the newspapers and in other periodical works of the day, some of which attracted the notice of his learned countrymen; and, in 1754, he was made a member of the Physico-medical Society, then lately established at Bâle, to the Transactions of which he contributed many interesting papers. In 1756 he went to Göttingen with two of his pupils, and in 1757 to Utrecht. The next year the party returned to Coire, by way of Paris, Marseilles, and Turin. At Paris he paid a visit to D'Alembert, who does not appear at that time to have appreciated his merit very highly, though he afterwards rendered him some services with the king of Prussia; but he became more intimately acquainted with Messier the astronomer.

In 1759 he quitted the family of the Count de Salis, and went to settle at Augsburg, having a small salary as a member of the Electoral Academy of Bavaria. From 1761 to 1763 he was again at Coire and in its neighbourhood, being employed in fixing the boundaries between the country of the Grisons and the Milanese territory. Towards the end of 1763, having had some disputes with the Bavarian academicians, he went to Leipzig, and the next year to Berlin, where he was made a member of the Royal Academy of Sciences, and where he continued to reside during the remainder of his life, receiving many marks of favour from the discriminating liberality of Frederic: thus, in the year 1770, he was made superior counsellor of the board of works, with an additional salary. He contributed a number of valuable memoirs to the collection of the academy; and in 1774 he undertook the direction of the *Astronomical Almanac*, for which he was admirably qualified. He was also a constant writer in the journal published by Nicolai, under the title of the *Universal German Library;* and he kept up a very extensive correspondence on various subjects of literature and science.

He was regularly in the habit of writing or reading from five in the morning till twelve, and again from two till midnight; a degree of application unquestionably far beyond that which would have been best calculated for producing the maximum of valuable effect. Perhaps, if he was paid for writing by the ream, he may have earned as much from the booksellers as he would have done by a more judicious economy of his powers; but a nervous system, attenuated by the daily study of seventeen hours, could never have been capable of being employed in any very elevated flights of genius, or in the invention of any sublime or exquisite novelties either in science or in literature; and it is only wonderful that he did any thing so well, as almost to form an exception to this general remark. He was indeed supposed to have injured his health by continued application, and he died consumptive, on the 25th September 1777, at the age of forty-nine. He had never been married. His person was of the middle size, with an interesting and expressive countenance; he was ambert, ohn Henry.

animated and lively in conversation, and liked discussion, but not disputation. He had no literary quarrels; and his criticisms were not offensive, even when they ceased to be flattering. His morals were strictly correct, but his manners were not altogether in unison with those of the society to which his talents had elevated him. He is said to have been timid, awkward, slovenly, and fond of low company; but upright, patient, unostentatious, and compassionate; essentially modest, but as ready to assert his own merits as to admit his defects. He had a happy facility in managing the instruments of computation, especially in the arrangement of converging series; and he had a peculiar talent for expressing the results of observation by an analytical formula, having first thrown them into the form of a geometrical diagram to assist his invention; a process which he employed with regard to the probabilities of life in London, and to the inequalities of Jupiter and Saturn. In short, after Euler, Lagrange, D'Alembert, and Daniel Bernoulli, there are few mathematicians and natural philosophers of any age who can be put in competition with him, and still fewer who benefited the public by so many diversified labours.

It would be hopeless to attempt to pursue his indefatigable pen through all its wanderings; and a complete catalogue of his works would be as useless as it is unattainable. A man who wrote so incessantly must have written many things which were destined to oblivion from their first production. It will be sufficient to mention the most remarkable of his works, without any very strict regard to the priority of their publication.

1. In the *Acta Helvetica of the Society of Bâle*, ii. 1752, we find an Essay on the Force and Measurement of Heat, a subject which the author resumed in the latter part of his life. 2. A General Series, somewhat resembling Taylor's, *Act. Hel.* iii. 1758. 3. Meteorological Observations, *ibid.* 4. He also published a paper on the Vibration of Chords, in the same collection.

5. Les Propriétés les plus Remarquables de la Route de la Lumière par les Airs, et en général par plusieurs milieux Refringents, Hague, 1759, in 8vo; German by Templehof, Berl. 1773. This work does credit to the ingenuity and mathematical abilities of the author, though its results may be obtained in a simpler manner by some methods more recently invented.

6. La Perspective Libre, Zurich, 1759, 8vo; another edition in German. The second German edition, 2 vols. 8vo, Zurich, 1773, contains some additional matter, especially a system of geometry, depending, as it is said, upon the ruler alone, without any other instrument. Such a system must, however, have been extremely limited in its application, much more so than Mascheroni's *Geometria del Compasso*.

7. Photometria, sive de Mensura et Gradibus Luminis Colorum et Umbræ, Augsb. 1760, 8vo. This original and interesting volume includes and supersedes the greater part of Bouguer's experimental determinations. It contains the important discovery, that a luminous surface emits its light with equal intensity in all directions; together with some improvements in the theory of twilight, and an investigation of the comparative light of the sun and moon, and stars and planets.

8. Insigniores Orbitæ Cometarum Proprietates, Augsb. 1761, 8vo. We here find the elegant theorem for expressing the relation of the area of a sector to the sides of the triangle inscribed in it. This theorem had been demonstrated with respect to the parabola by Euler in 1740; but Lambert first extended it to the other conic sections, and he certainly re-invented the whole, without being aware of what Euler had done. It may be found, together with a concise demonstration, and a further account of this work, in the translation of Olber's *Essay on Comets*, published in the *Journal of the Royal Institution*.

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9. Cosmologische Briefe, Augsb. 1761, 8vo. A French translation of these Letters on the Universe appeared in the *Journal Helvétique of Neuchâtel*, 1763-4; an extract was published by Merian, with the title of *Système du Monde*, Bouillon, 1770, Berlin, 1784, in 8vo; and a translation by Darquier appeared at Amsterdam, 1801, in 8vo. The whole work is written in a popular style, and adapted to the taste of general readers. The author's favourite idea was to make the sun a sort of planet, revolving round some other great body; and he supports the opinion by an argument derived from the supposed insufficiency of the laws of gravity, as relating to the solar system, for explaining some of the inequalities of the motions of Jupiter and Saturn, which have, however, since been reduced to the general analogy by Lagrange and Laplace.

10. Zusätze zum Traité de Nivellement Von Picard, 12th August 1761, explaining some improvements on Picard's level, executed by Brander, an ingenious artist, whom Lambert also assisted in the improvement of Gunter's sliding rule. 11. He published an explanation of this scale, entitled Logarithmische Rechenstäbe, 12th August 1761.

12. Remarks on Incommensurable Quantities, *Mém. Ac. Berl.* 1761. A demonstration of the incommensurability of the circumference of a circle to its diameter, which has been adopted by Legendre in his Geometry. It depends on the method of reducing a fraction to its lowest terms, as laid down by Euclid, and on the properties of continual fractions; an expression is obtained for a tangent in terms of the arc from the quotient of the series for the sine and cosine, and the continual fraction thus obtained is proved to be infinite. It is also shown that the ratio of the arc to its tangent can never be expressed by any finite quadratic surds. 13. On the Specific Gravity of Salt, and of its Solutions, *M. Berl.* 1762.

14. Novum Organum, Leipzig, 1763, in German, two vols. 8vo. An attempt to restore and improve the Aristotelian method of syllogism, in which the author is allowed to have displayed much ingenuity, though its success was greatly limited, on the one hand, by the sober good sense of the empirical reasoners of the school of Bacon and Locke, and, on the other, by the wild enthusiasm of the German innovators, who were beginning to be intoxicated with the high-sounding phrases and exaggerated pretensions of the disciples of Kant. A manuscript Latin translation of the work, by Pfleiderer, was once in the possession of the late Lord Stanhope.

15. A paper on Trigonometry appears in the *Nova Acta Eruditorum* for 1763. 16. In the *Berlin Memoirs* for the same year, we find an Essay on Acoustic Instruments, investigating the best forms for hearing trumpets. 17. Remarks on the Properties of Equations of all Degrees. 18. On Divisors of Equations, which may be found without solving them. 19. On some Measurements relating to the Intellectual World; that is, on probabilities and expectations.

20. Beyträge zur Mathematik, Berlin, 1765, 1770, 1772, in four vols. 8vo: a collection of essays on every department of mathematical science. The first volume contains Remarks on Trigonometry, and on the Certainty of Observations; on the Divisors of Numbers, and on Annuities: the second, Tables of the Moon; an Essay on Dialling, and on Geographical Projections, with the Elements of Tetragonometry, a subject which was afterwards resumed by the younger Mayer: in the third volume there is an Essay on Interpolation, Remarks on Celestial Maps, with other articles.

21. Description of a Table of Eclipses, Berl. 1765, with the easiest mode of computing them. 22. In the *Memoirs of the Academy of Berlin* for 1765, we have a paper on Projectiles, including the effect of resistance. 23. In those of the *Bavarian Academy* for the same year, some remarks

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on the Improvement of Terrestrial Measurements; and, 24. Meteorological Observations. 25. In the *Nov. Acta Erud.* for 1765, An Attempt to employ Calculation in the Moral Sciences. 26. On the Magnet, *Ac. Berl.* 1766. 27. Another paper on Magnetic Currents. 28. A Magnetic Chart was published separately the same year. 29. Remarks on the General Outline of the Ocean, *Ac. Berl.* 1767. 30. A General Solution of the Problem of Three Bodies by means of Series, *ibid.* 31. Notes on Richer's Philosophical Algebra, 1767.

32. Remarks on the Velocity of Sound, *M. Ac. Berl.* 1768; an unsuccessful attempt to reconcile the theory with observation. It was reserved for Laplace, by a single happy suggestion, to remove the whole difficulty. 33. On Photometry, as applied to Painting, *ibid.* 34. Trigonometrical Observations, *ibid.*

35. De Topicis Schediasma, 1768. 36. Remarks on the Divisors of Numbers, *Nov. Act. Erud.* 1769. 37. Anmerkungen über die Branderschen Micrometern, Augsb. 1769. Brander's micrometers were of glass.

38. Experiments on Hygrometry, *M. Acad. Berl.* 1769; relating to evaporation, and to the indications of hygrometers, especially those of catgut.

39. Supplementa Tabularum Logarithmicarum, 8vo, Berl. 1770; with a valuable introduction in German, on the abridgment of computations.

40. Anmerkungen über die kraft des Schiesspulvers, 8vo, Berl. 1770. In this investigation of the force of fired gunpowder, the author attacks several points in the theory of Robins, published a few years before.

41. Hygrométrie, 4to, Augsb. 1770.

42. On Directors for the Light of Lamps, *M. Acad. Berl.* 1770. 43. On Ink and Paper, *ibid.* 44. Analytical Observations, *ibid.;* relating to the general theorem resembling Taylor's, which was further discussed by Euler, and modified by Lagrange. 45. On Taxeometry, or the Measurement of Order, *ibid.;* considered as comparable in degree, and expressible by numbers.

46. Architectonik, 2 vols. 8vo, Riga, 1771; a logical and metaphysical treatise on the most simple bases of philosophical and mathematical knowledge, written in 1763. The last part, which relates to magnitude, is the most approved; but the whole work was never much read, being partly superseded by the more ostentatious novelties of the day.

47. In the *Berlin Memoirs* for 1771, we find papers on Meteorology. 48. On the Atmospheric Influence of the Moon. 49. On Achromatic Telescopes of one kind of Glass only. 50. On the Apparent Paths of Comets. 51. On the Grounds of Superstitious Belief, as compared with Probability.

52. Ueber das Farbenpyramide, 8vo, Berl. 1772; a description of a pyramid of wax, intended for the illustration of all the possible varieties of combination of the primitive colours.

53. Astronomisches Jahrbuch, Berl. 1774–9, in 8vo; an accurate and extensive ephemeris, with many original communications annexed to it.

54. In the *M. A. Berl.* 1772, a paper on Friction; supposed to follow the law of the resistance of fluids, with some remarks on that resistance. The opinion of the uniformity of the force of friction, which was even at that time general, was somewhat too hastily rejected by the author; but his computations may still be of use in some cases. 55. On the Fluidity of Sand; as resisting motion. 56. On Hygrometry; continued. 57. On the Density of the Air, with respect to sound and to refraction.

58. *M. A. Berl.* 1773: A Balistic Scale; for determining the paths of projectiles in the atmosphere. 59. Physical Observations, relating to Meteorology and to Optics. 60. On the Satellite of Venus; affording a remarkable instance of misapplied labour and ingenuity. 61. A Second Essay on Taxeometry. 62. A Note on the Inequalities of Jupiter and Saturn; intended to confirm the principles advanced in the Cosmological Letters. The detail was reserved for a subsequent volume.

63. *M. A. Berl.* 1774: On the Temperament of Musical Instruments. 64. On Aerial Perspective. 65. Report on a Bedstead for Sick Persons.

66. *M. A. Berl.* 1775: On the Elasticity of the Air. 67. On Windmills, and on the Force of the Wind. 68. On the Sounds of Flutes; an elaborate comparison of the various tones of a flute, with the theory of Daniel Bernoulli for determining the sounds of compound organ-pipes.

69. *M. A. Berl.* 1776: On the Strength of Men employed in Labour. 70. On Imperfect Fluids.

71. *M. A. Berl.* 1777: On the Elasticity of the Air.

72. *M. A. Berl.* 1779: Two Memoirs on the Inequalities of Jupiter and Saturn.

73. Pyrometrie, 4to, Berl. 1779; a posthumous work, upon a subject which had long occupied the author's attention; with a Preface by Karsten, and a Biographical Memoir by Eberhard.

74. A Paper on Annuities, *Leipz. Magaz.* 1780.

75. Deutscher Gelehrter Briefwechsel, Berl. 1781–7, in five vols. 8vo; published by John Bernoulli, and consisting principally of the author's correspondence with Holland, Kant, Karsten, Segner, Basedow, Scheibel, and Brander. The contents are more fully described by Lalande. *Bibl. Astr.* p. 584.

76. *M. A. Berl.* 1783: On Friction.

77. Logische und Philosophische Abhandlungen, Berl. 1787, in two vols. 8vo. Edited by J. Bernoulli.

78. On the Theory of Parallel Lines, *Hinderb. Arch. der Math.* i.

(Bernoulli in *Nouvelles Littéraires*, 8vo, Berl. 1777: Eberhard in *Pyrometrie Briefwechsel*, iii. *Phil. Mag.* May 1804; Aikin's *General Biography*, vi. 4to, Lond. 1807; Servois in *Biographie Universelle*, xxiii. 8vo, Par. 1819.) (L. L.)

Lambeth.

LAMBETH, a very large parish in the hundred of Brixton, in the county of Surrey. It may be considered as one of the suburbs of London, on the south side of the Thames, and only separated from it by that river. Its boundaries are very wide, extending on the east from Southwark, to Wandsworth on the west, and till it comes, at Norwood, in contact with Croyden to the south. It is remarkable for the palace of the Archbishop of Canterbury, an ancient and magnificent pile of building, of the architecture of various ages, from the year 1197 down to the present time, when it has been recently repaired and beautified by the taste and the munificence of the present occupier of that high ecclesiastical dignity. The library contains a most curious and valuable collection of books and manuscripts, calculated to throw much light on the ecclesiastical and civil history of the kingdom, as well as on the pedigrees of many illustrious families. The buildings, park, and gardens, are said to contain thirteen acres. The parish church is near the palace, and is a small old building; but new churches of appropriate size have been built under the recent act for building churches in different parts of the parish, which, though not quite adequate to the population, afford tolerable accommodation to the worshippers. The parish contains several large establishments of a benevolent kind, especially the new bedlam for insane persons, the philanthropic institution, and the asylum for female orphans, and the Westminster lying-in hospital. From its easy access to London, which three of the bridges over the Thames afford, many valuable manufacturing and commercial establishments are within the parish. Boat-building is one that gives employment to numerous persons. Iron-founderies, and especially shops for making steam-engines of all powers, are extensive branches of trade. Breweries and distilleries are among the list of its means of industry, and especially establishments for making vinegar and British wines. The celebrated gardens of Vauxhall are within this parish, and have been of late much improved in magnificence, as well as in the moral decorum, which was formerly a subject of regret and complaint. The parish is now divided into five districts, viz. St John's Waterloo, Kennington, Brixton, Norwood, and that which remains to the parish church. The annual value of the real property, according to the assessment of 1815, was L.220,618. Few parishes show a more rapid increase of population than this. The inhabitants amounted in 1801 to 27,939, in 1811 to 41,644, in 1821 to 57,638, and in 1831 to 87,856. Under the reform bill, Lambeth returns two members to the House of Commons.

LAMBIN, Denis, one of the most learned Frenchmen of the sixteenth century, was born at Montreuil-sur-Mer, in Picardy, about the year 1516. He studied at the College of Amiens, where he afterwards officiated for some years as professor of belles-lettres. He then accompanied Cardinal de Tournon to Rome, and profited by his stay in Italy to visit the principal cities, and to form friendly connections with the learned men of that country. On his return to Paris, he was appointed professor of eloquence in the Royal College, through the influence of Amyot and the Cardinals of Lorraine and of Tournon; and the following year he was promoted to the chair of Greek. He commenced his prelections by an excellent discourse, in which he traced out the course which he proposed to follow, and announced that he would explain alternately the Iliad and the Philippics, the two works best calculated to form poets and orators. The number of his auditors was considerable; but the contagious malady which then devastated Paris soon thinned his class, and also carried off a nephew to whom he was much attached, an event which drove him to seek, in a distant retreat, some alleviation of the grief which overwhelmed him. But his prelections were not long interrupted; and although already overburthened with labour, he consented, in the year 1570, to explain Cicero to some select pupils in the College of Lemoine. A witness of the civil troubles which then distracted France, Lambin bewailed them in secret; the massacre of the Protestants made a terrible impression on his mild and gentle spirit; and whilst the sorrow thus occasioned was recent and fresh, the news of the death of his friend Ramus arrived to complete his affliction. Unable to bear up under such an accumulation of calamities, he sunk the victim of grief, and died towards the end of September 1572, about a month after the tragedy of St Bartholomew. By his marriage with a lady of the house of the Ursins he left a son, who became preceptor to Arnauld and Andilly, and who also possessed much erudition. Lambin, though of a mild and modest character, had nevertheless his enemies. He was accused of appropriating the researches of his contemporaries without due acknowledgment; but there appears to be no foundation whatever for the charge. On the contrary, it was Lambin himself who had reason to complain of the plagiarisms of Muretus and his disciple Giphanius. He had also a warm dispute with Paulus Manutius on the orthography of the word *consumptus*, from which Lambin maintained that the letter *p* ought to be expunged; and it is even said that the disputants became so warm, that, in the course of this absurd controversy, they proceeded from mutual reproaches to blows. The style of Lambin is easy and pure, but diffuse and somewhat heavy; and his enemies characterised it by the word *Lambiner*, which has remained in the language. The works of this laborious scholar are, 1. Latin Translations of the Select Speeches of Æschines and Demosthenes, Paris, 1565, in 4to; of the Speeches of Demosthenes on the Crown, ibid. 1587, in 4to; and of the Morals and Politics of Aristotle, reprinted in the editions of that philosopher's works by Isaac Casaubon and Duval. 2. Editions of Lucretius De Rerum Natura, Paris, 1563, in 4to; of the Works of Cicero, Paris, 1566, in four vols. folio; of the Works of Demosthenes in Greek, Paris, 1570, in folio; of the Comedies of Plautus, Paris, 1576, in folio; and of Cornelius Nepos, ibid. 1569, in 4to. 3. Ciceronis Vita ex ejus Operibus collecta, Cologne, 1578, in 8vo. 4. Several very interesting Discourses, of which the reader will find some account in the Supplement to the Dictionary of Moreri, edition of 1749. 5. Prefaces and Epistles Dedicatory, collected, along with those of Muretus (Muret) and Regius (Leroi) in the *Trium Illustrium Virorum Præfationes*, Paris, 1679. 6. Letters in the different collections of the *Epistolæ Clarorum Virorum*. (See Tessier, *Eloges des Hommes Savants*; and Goujet, *Histoire du Collège Royal*.) (A.)

LAMECH, of the race of Cain, was the son of Methusael, and father of Jabal, Jubal, Tubal-Cain, and Naamah. Lamech is celebrated in Scripture for his polygamy. One day he said to his wives, "Hear me, ye wives of Lamech; I have slain a man to my wounding, and a young man to my hurt. If Cain shall be avenged seven fold, truly Lamech seventy and seven fold." These words contain an unintelligible riddle. The reader may consult the commentators. There is a tradition amongst the Hebrews, that Lamech, growing blind, ignorantly killed Cain, believing him to be some wild beast; and that afterwards he slew his own son Tubal-Cain, who had been the cause of this murder, because he had directed him to shoot at a certain place in the thickets where he had seen something stir. Several other suppositions are produced to explain this passage concerning Lamech, but all seem equally uncertain and absurd.

Lamech, the father of Noah. He lived an hundred fourscore and two years before the birth of Noah (Gen. v. 25, 31); and after that he lived five hundred and ninety-five years longer.

LAMEGO, a city of Portugal, in the province of Beyra. It is situated on the south side of the river Douro. The country which surrounds it yields the best port wine, and in large quantities. As the roads in Portugal are generally bad, the mercantile company of the higher Douro have in some measure obviated the evil by constructing a good road from Lamego to Oporto. The wines are now brought with less inconvenience than formerly, and are less subject to impure mixture than when they were transmitted by the internal voyage on the river. Lamego is a bishop's see, and has a splendid cathedral, library, vineyards, and a fair. It has one ruined castle, one parish church, four monasteries, one hospital, one alms-house, 1648 houses, and 6592 inhabitants.

LAMENTATIONS, a canonical book of the Old Testament, written by the prophet Jeremiah (according to Archbishop Usher and some other learned men, who follow the opinion of Josephus and St Jerome) upon occasion of Josiah's death. But this opinion does not seem to agree with the subject of the book, the lamentation composed by Jeremiah on that occasion being probably lost. The fifty-second chapter of the book of Jeremiah was probably added by Ezra as a preface or introduction to the Lamentations. The first two chapters are employed in describing the calamities of the siege of Jerusalem; in the third the author deplores the persecutions which he himself had suffered; the fourth treats of the desolation of the city and temple, and the misfortunes of Zedekiah; the fifth chapter is a prayer for the Jews in their dispersion and captivity; and at the close of all, the author speaks of the cruelty of the Edomites, who had insulted Jerusalem in her misery. All the chapters of this book, except the last, are in metre, and digested in the order of the alphabet, with this difference, that in the first, second, and fourth chapters, the first letter of every verse follows the order of the alphabet, but in the third the same initial letter is continued for three verses together. This order was probably adopted that the book might be more easily learned and retained. The subject of this book is of the most moving kind; and the style throughout is lively, pathetic, and affecting. In this kind of writing the prophet Jeremiah was a great master, according to the character which Grotius gives of him, *Mirus in affectibus concitandis.*

LAMIÆ, a sort of demons who had their existence in the imaginations of the heathens, and were supposed to devour children. Their form was human, resembling beautiful women. Horace makes mention of them in his Art of Poetry. The name, according to some, is derived from *lanio*, to tear; according to others, it is a corruption of a Hebrew word signifying to devour. They are also called *larvæ* or *lemures.*

LAMINGTON PRIORS, a town of the hundred of Knightlow, in the county of Warwick, in a pleasant situation on the banks of the river Leam, ninety miles from London, and two from Warwick. Owing to the discovery of some mineral springs of several kinds, it has grown in a few years from a village to a handsome and considerable town, frequented by numerous visitors both for health and amusement. An hotel, a church, and a market, have been erected, with conveniences for bathing and drinking the waters. The population amounted in 1801 to 315, in 1811 to 543, in 1821 to 2183, and in 1831 to 6209.

LAMJUNGH, an extensive district in Northern Hindustan, tributary to the Ghoorkhali rajah of Nepaul. It has the great Himalaya ridge for its northern boundary; and, like the rest of Northern Hindustan, it has an elevated and rugged surface, with intervening fertile valleys, watered by streams from the northern mountains. The district has been imperfectly explored. The principal towns are Mucundnath and Lantargur.

LAMMAS-DAY, the first of August, so called, as some will have it, because lambs then grow out of season by becoming too large. Others derive it from a Saxon word, signifying *loaf-mass*, because on that day our forefathers made an offering of bread prepared from new wheat.

LAMOIGNON, CHRETIEN-FRANÇOIS DE, eldest son of M. Lamoignon, first president of the parliament of Paris, was born in that city on the 26th of June 1644. Not choosing to intrust his education to any one, his father became his first instructor, and taught him the elementary parts of learning. After having attended a course of rhetoric under Rapin, young Lamoignon applied himself to the study of law, and in this pursuit found great assistance in the conferences of the advocates whom the president assembled at his residence. It was the wish of the president that his son should first appear at the bar as a simple advocate; and, accordingly, the latter continued for about two years in the ordinary practice of the profession. Possessing a refined taste, and full of the good principles which he had derived from the study of the ancients, the young lawyer brought to the courts of law that judicial eloquence which the mania for citation and false display had exiled from their precincts. In 1666, he was appointed counsellor to the parliament. Two years afterwards, when the plague had appeared at Soissons, and apprehensions were entertained that the contagion might reach Paris, M. de Lamoignon was employed to take the necessary measures for arresting its progress. In the discharge of this duty he displayed equal energy and intelligence. Whilst abundant resources of medicine were accumulated at Soissons to combat the evil at its source, he established a sanitary line or cordon, which completely intercepted all communication with the centre of infection. He had himself written out the details of this operation, so foreign to the nature of his ordinary pursuits, but which was nevertheless crowned with complete success. Being appointed master of requests some time afterwards, he was one of the commissioners whom Louis XIV. formed into a particular council, when he himself held the seals after the death of the chancellor Seguier. In 1674, he was appointed advocate-general to the parliament, an office which had become vacant by the death of a son of the celebrated Bignon. During the twenty-five years that he held this office, he rendered the most important services to jurisprudence; and if the eloquent pleadings he pronounced have not been preserved, history has at least transmitted to us the sentiments of admiration which they excited. It is to a discourse pronounced in the cause of the Marquis of Langey by this celebrated magistrate, who knew so well how to reconcile the interests of morality and society with the respect due to laws consecrated by long usage, that France owes the abolition of the *congress* (a court for proving virility or impotence), an institution worthy of the rude age that gave it birth, but which had hitherto been preserved. It was in conformity with his conclusions that the decree of abolition was pronounced by the first president, his father. Louis XIV. had thought of Lamoignon for the situation of first president of the parliament; a mistake, perhaps even an intrigue, had deprived him of that of attorney-general, which was given to Labriffe; but the distinction with which he exercised the functions of advocate-general, his zeal, and his marked predilection for that office, induced him to retain it eight years after he had been made president *à mortier*, that is, in 1690. In 1707, when enfeebled by the excessive labour he had undergone, he resigned in favour of his eldest son, and died on the 7th of August 1709. M. de Lamoignon loved and cultivated letters; and his intimate connections with some of the greatest geniuses of his age, particularly with Bourdaloue, Boileau, Racine, and Regnard, have also added to his celebrity. It is to him that the sixth epistle of Boileau is addressed. But notwithstanding his friendship for men of letters, he refused to become a member of the French Academy, when that society called upon him to join it; though he afterwards accepted a place in the Academy of Inscriptions, of which he became president. The only production of M. de Lamoignon that has been printed is his letter on the death of Bourdaloue, which is appended to the third volume of the *Carême* of that celebrated preacher; but he also wrote a life of his father, Guillaume de Lamoignon, which is said to breathe the most ardent filial piety and affection. (A.)

LA MOTTA, a town of Italy, in the Austrian delegation of Treviso. It stands at the junction of the rivers Montegano and Livenza, is defended by a castle, and contains 3276 inhabitants.

LAMP,

A CONTRIVANCE for giving light. Lamps were in general use amongst the Jews, Greeks, and Romans. The candlestick with seven branches, placed in the sanctuary by Moses, and those which Solomon afterwards prepared for the temple, were crystal lamps filled with oil, and fixed upon the branches. The lamps or candlesticks made use of by the Jews in their own houses were generally put into a very high stand on the ground. The lamps supposed to be used by the foolish virgins, in the gospel, were of a different kind. According to critics and antiquaries, they were a sort of torches, made of iron or potters' earth, wrapped about with old linen, and moistened from time to time with oil. (Matth. xxv. 1, 2.) The lamps of Gideon's soldiers were of the same kind. The use of wax was not unknown to the Romans, but they generally burned lamps; and hence the proverb *Tempus et oleum perdidi*, I have lost my labour. Lamps were sometimes burned in honour of the dead, both by Greeks and Romans. The testimony of Pliny, St Austin, and others, have led many to believe that the ancients had the invention of perpetual lamps; and some moderns have absurdly attempted to find out the secret. The curious may read Dr Blot's conjectures on the subject in the *Philosophical Transactions*, No. 166.

ubstances sed for urning.

Lamps are usually fed by expressed oils from vegetable or animal substances. In Britain, whale-oil, boiled from the subcuticular fat of the whale, is used for common lamps.

Tallow is one of the most common substances employed for giving light. The spermaceti, which is found within the cavity of the cranium of the spermaceti whale, is also used. There is a substance resembling spermaceti, formed by the decomposition of the muscular flesh of animals in moist places, which has been employed. Bees' wax, a vegetable substance collected by the bee, and which, in some of its qualities, resembles the essential oils, is one of the best materials for giving light.

In no region of the globe are human beings found to exist without a supply of oil derived from animals or from vegetables; and in the more fertile regions several different plants, peculiar to each region, are cultivated on account of the fixed oil which is extracted from their seeds by pressure. These oils vary in quality. The oils fit to be employed in food are the most valued. Of the rest, many have the qualities which fit them for burning in lamps.

At Paris, oil of rape-seed and oil of poppy-seed are clarified for the lamp by filtering through cotton wool, and other processes. In the south of France and Italy the inferior kind of olive oil is used in lamps, and sometimes the oil of the plant called *Arachis hypogœa*, or earth-nut. In Italy, lamp oil has been expressed from the stones of the grape. In Piedmont, walnut-oil is used for lamps. On the eastern and southern coasts of the Mediterranean, and in China, they use oil of sesamum seed, called in Arabic *semsom*. In tropical countries, cocoa-nut oil, which, in the temperature of Britain, is solid and white like tallow, is burned in lamps made of the shell of the cocoa-nut and of bamboo. Much of the oil used in China is obtained by expression from the seeds of the tree called by botanists *Camellia oleifera*, which is extensively cultivated for that purpose, as is the shrub called *Croton sebiferum*, on account of the solid oil or tallow which the Chinese express from its fruit. Essential oils, extracted from plants by distillation, are too volatile, and, in consequence of their volatility, are too easily inflamed, to be used in lamps.

Petroleum and naphtha issue from the earth in several places, and these sources are generally in secondary strata, and originate from fossil vegetable matter, in a state approaching to that of pit-coal. A source of petroleum existed some years ago near Colbrook Dale, and there is one at St Catherine's near Edinburgh. The greatest natural deposits of petroleum and bitumen are in the island of Trinidad, and in the Dead Sea in Judæa. Naphtha is the most liquid of the oils proceeding from fossil vegetable matter, and possesses qualities very fit for burning in lamps. It is employed for this purpose at Genoa, where the streets are lighted with naphtha from Amiano in the adjacent territory. Naphtha, obtained in the state of a clear, colourless liquid, by distillation from pit-coal, has of late been employed for burning, in street lamps, in London.

Alcohol or spirit of wine, being cleaner than oil, is convenient for feeding a lamp that serves to heat a liquid in a small vessel; but the flame is blue, and therefore it is not suitable for giving light. In a spirit lamp, the surface of the spirit must be covered to exclude the air, for the spirit would catch fire if its surface were exposed.

Sulphuric ether is too easily inflamed, and too costly to be used for feeding lamps.

The wick.

In a lamp for the purpose of giving light without a considerable quantity of heat, it is required that only a small portion of the oil shall be inflamed at once; therefore, by means of the wick, a small portion of oil, minutely divided so as to expose a large surface, is subjected to the action of the heat; the heat decomposes the oil, and the gas resulting from the decomposition is burned by the atmospheric air which surrounds the wick. In the gas lights, which have come into general use in manufactories and cities in Britain, the operations of producing the gas and inflaming it, which take place at one time in the wick of a lamp, are performed separately. The gas is obtained from pit-coal, oil, or wood, but best from pit-coal or from oil, by heating these substances strongly in a retort; and, when extricated, is conveyed away in pipes to the place where it is to be inflamed. The capillary attraction of the filaments of the cotton which compose the wick of a lamp, raises up a small portion of oil into a situation where it may be exposed to the degree of heat necessary for producing flame.

In lamps of the most common structure, the wick should not be elevated too high above the surface of the oil; for, in that case, the capillary action by which the oil rises between the filaments of the cotton will not be able to raise it to so great a height. If the wick is too little elevated above the surface of the oil, there will not be a sufficient quantity of the oil converted into the gas, whose combustion constitutes the flame, and the flame will be too small.

Many lamps used by the Greeks and Romans have been found in the ruins of ancient towns. These ancient lamps are of pottery, painted and sculptured with various ornaments, and of bronze. The surface of the oil in the reservoir is nearly on a level with the lighted part of the wick, which emerges from a projecting beak at the side of the reservoir.

Varieties in the structure of lamps.

The lamp commonly used in rooms at Florence consists of a round reservoir, with four beaks projecting from four opposite points of its circumference; through the middle of the reservoir a vertical stalk passes; and on this stalk the lamp may be raised or slid down. The stalk is fixed in a foot that rests on the table, and the whole is made of brass.

A lamp, which affords a faint light, is made of a waxed wick, an inch long, passed through the centre of a thin round piece of cork, and of a piece of card placed above the cork. Some oil is placed on the surface of water in a glass tumbler, and the cork, with its wick, is laid upon the surface of the oil. This lamp, called a *veilleuse*, is commonly used in Paris for burning in bed-rooms during the night, as rush-lights are in London.

The lamp with a hollow cylindrical wick, which receives a current of air, both on the outside and the inside of the cylinder, is called in England an *Argand lamp*, from the name of one of the first makers. The wick in Argand's lamp, as first constructed, was raised by a rack and pinion; but the method now employed to raise the wick consists in a spiral notch, which goes round outside of the interior tube. The inside of the ring to which the wick is attached has a tooth which fits into this notch.

At fig. 2, Plate CCCXXI., is a representation of the most usual form of the Argand lamp. A is a reservoir, which is air-tight at top, and has the neck immersed in oil, so that oil flows out of it only when the external air is admitted to ascend through the neck: it contains a short column of liquid, from the top of which the pressure of the atmosphere is excluded, and therefore the column is sustained by the weight of the atmosphere pressing on its base, on the same principle as a bird-cage fountain.

Oil is introduced into the reservoir A, by taking it off, and holding it with the neck uppermost. The sliding tube Q is pushed so as to uncover the hole *t*, and the oil is poured in by the hole *t;* when this is done, the hole is again covered by the sliding tube, and the reservoir A is replaced in F. When the lamp is to be lighted, the hole *t* is opened by depressing the sliding tube by its handle *z*, and the oil will flow out of A till it rise in F, and in the annular cavity that contains the wick, to the level of the top of the hole *t*. When the oil in F is lowered by the burning of the lamp, so that the surface of the oil in F is below the upper part of the hole; then a bubble of air ascends into A, and a quantity of oil descends into F, till the surface of the oil rises again to cover the upper part of the hole. It sometimes happens that the air in A is heated by the warmth of the room, and then too great a quantity of oil descends into F, in consequence of the expansion of the hot air in the upper part of A, so that the oil not being all consumed in the wick, falls down through the tube *g*, and may even run over from the cup P. This is a considerable inconvenience attending oil reservoirs of the construction here mentioned. The hole *t* is closed by drawing up the sliding tube Q, when the lamp is not burning, in order that the lamp may be inclined, without making the oil descend from the reservoir.

The cylindrical part, where the flame is produced, is composed of three tubes *d, f, g.* The tube *g* is soldered to the bottom of the tube *d*, just above *o*, and the interval between the outer surface of the tube *g* and the inner surface of the tube *d*, is an annular cylindrical cavity closed at bottom, containing the cylindrical cotton wick immersed in oil. The wick is fixed to the wick tube, which is capable of being moved spirally; within the annular cavity is also the tube *f*, which is capable of being moved round, and serves to elevate and depress the wick. P is a cup that screws on the bottom of the tube *d*, and serves to receive the superfluous oil that drops down from the wick along the inner surface of the tube *g*. The air enters through the holes *o o*, and passes up through the tube *g* to maintain the combustion in the interior of the circular flame. The air which goes to perform the combustion on the exterior part of the wick enters through the holes *m*, with which *r n* is perforated. When the air in the chimney is rarefied by the heat of the flame, the column of the atmosphere, of which the chimney is the base, becomes lighter than the surrounding columns; and the surrounding columns, pressing with their excess of weight, enter the lower part of the chimney, and pass upward, with a rapid current, to restore the equilibrium between the adjacent columns of the atmosphere.

In some lamps, above the orifice of the tube *g*, and nearly at the height of the top of the flame, there is placed a circular plate of metal, of the same diameter as the tube: this has the effect of turning the current of air into that part of the flame where smoke would otherwise be produced. The same effect is obtained by the contraction of the cylindrical glass chimney at R G: the contraction of the chimney was commonly employed in Paris before it was used in England.

The oil flows from the reservoir A and F through N, and occupies the cavity between the exterior surface of the tube *g*, and the inner surface of the tube *d*. The oil rises in the annular cylindrical cavity between these two tubes to the level of the opening *t*. The part *w i* is a short tube, which receives the circular wick, and slides freely on the tube *g*. The tube *g* has a hollow spiral groove on its exterior surface, into which enters a pin *k*, connected with the wick-tubes *w i*. The wick-tube has a catch, which works in a perpendicular slit in the tube *f;* and, by turning the tube *f*, the wick-tube will be raised or lowered; *r n* fits on the tube *d; r n* is fitted to receive the glass chimney R G; a wire *s* is attached to the tube *f*, and is bent over the edge of the tube *d*, and descends along the outside of the tube *d*. The part *n r*, that supports the glass chimney, is connected, by four other wires, with the ring *y*, which surrounds the tube *d*, and is capable of being moved round. When *n r* is turned round, it carries round along with it the ring *y*, the wire *s*, and the tube *f*, and thereby operates the elevation and depression of the wick.

The glass chimney which rests on R N is wider at bottom, and then is contracted at R G, for the purpose of making the air rush upon the external part of the circular flame in a denser current.

In the most simple construction of lamps, the surface of oil in the oil-reservoir is nearly on a level with the flame, because the capillary attraction of the wick can only raise the oil a little above the surface of the reservoir. The surface of the reservoir also is considerable, that the lamp may burn for a sufficient length of time, before it has consumed so much oil as to reduce the level of the oil below the reach of the action of the capillary attraction of the wick. Mechanists have contrived and executed lamps of various forms, with the view of removing the inconvenience of the shadow of the reservoir, which is inherent in the common lamp with one lateral beak.

One of the contrivances for diminishing the bulk of the part in which the wick is immersed, and for obtaining a supply of oil, is the bird-cage fountain reservoir described above as being usually applied to Argand lamps. This kind of reservoir is described by Cardan, and a lamp fed by it is mentioned by several writers under the name of Cardan's lamp.

Baptista Porta, in treating of oil reservoirs of the kind just now mentioned, proposes that, for large lamps with many wicks, the reservoir should be placed above and without the room, and should communicate with the lamp within by a pipe. In this way, the oil would not be liable to be pressed out too rapidly by the expansion of the air in the reservoir, occasioned by the heat of the room; and several methods have been contrived for the purpose of placing the luminous part of the wick on the upper end of a stalk, so that very little of the sphere of rays proceeding from the lighted wick may be intercepted by the opaque part of the lamp. The following are some of these methods:

A lamp called the Amiens lamp, commonly used in Paris by the poorer classes, is in the form of a candle. The lighted part of the wick is at top. The lower part of this cylinder, which is of tin, has a valve opening upwards, and is moveable up and down in another cylinder, which has a valve opening upwards. This valve is plunged in the reservoir of oil; when the wick is in want of oil, the oil is pumped up by moving vertically the tin cylinder which contains the wick. Lamps of this kind are described in the *Transactions of the Academy of Sciences* for 1755, p. 139; and for 1760, p. 158.

A lamp for reading is made by Carcel of Paris, in which the oil is raised to the wick by means of a pump. The pump is moved by watch-work, composed of wheel and pinion, and a spring, which is wound up when the lamp is to be lighted.

In the twentieth volume of the *Philosophical Transactions*, St Clair, in a letter to Hooke, describes a lamp, in which the oil floats on water. A tube passes from the upper part of the vessel down to the water; and through this tube water is dropped, by means of which the surface of the oil is always maintained at the same level, whilst it is consumed by the flame in the wick.

In the lamp constructed by Mr Keir of Kentish Town, the oil is raised to the wick, and sustained by a column of a solution of salt in water. This liquid being of a greater specific gravity, a column of it counterbalances a longer column of oil. The solution of salt is made of such a specific gravity that it will support a column of oil four thirds of its own height. This is nearly the specific gravity of the heaviest saline solution that is known to exist in any great body of natural water, namely, in the Dead Sea; the weight of the waters of this sea, of distilled water, and of oil, being in the relative proportions of 120, 100, 92. To have an idea of this lamp, imagine a syphon with two upright branches, and the junction of the branches at the bottom. The shortest branch has a bulb at top. The longest branch has a bulb near its lower extremity. The shortest branch is filled with a solution of salt, whose upper surface is in the superior bulb. The longer branch contains the oil, and in its upper extremity the wick is placed. In the lower bulb the surface of the oil rests upon the surface of the solution of salt.

The bulbs serve as reservoirs, prolonging the action of the machine; by means of the bulbs and the greater specific gravity of the solution, it is effected, that the abstraction of a considerable quantity of oil by the combustion in the wick occasions but a small depression in the upper surface of the solution; the height of the sustaining column of solution will become shorter in proportion as the column of oil which it counterbalances is consumed; but this diminution of the height of the column of oil will be slow, and therefore the column of oil will for a considerable time be of sufficient length to reach the wick. Suppose an inverted syphon, of equal diameter throughout, the shorter leg of which contains a column of solution of salt, whose height is 75, and this counterbalances a column of oil, whose height is 100, in the longer leg; if now the column of oil in the longer leg be diminished in height by 10, the counterbalancing column of solution will diminish to 67·5, being 7·5 shorter than at first. But if the syphon, instead of being of equal diameter, has two dilatations or reservoirs, whose horizontal section is ten times the area of the tube of the syphon, one of the reservoirs being placed at the top of the short branch, so as to contain the upper surface of the solution of salt, and the other at the bottom of the long branch, so as to contain the surface where the oil rests upon the solution; then, if the same quantity of oil, as in the former example, is taken from the top of the longer leg of the syphon, the column of oil will only fall one tenth of what it did in the undilated syphon of equal diameter, and the solution of salt will diminish one tenth of what it did in the syphon of equal diameter.

The oil-reservoir and the wick remain stationary, and do not descend as the oil is consumed. This descent takes place in two lamps now to be mentioned, because in these two lamps the oil-reservoir swims in a liquid that acts as a counterpoise.

In the lamp contrived by the Chevalier Edelkrantz of Stockholm, the oil-reservoir floats in mercury, and the column of oil is maintained at the requisite height by the counterpoise of a column of mercury; in proportion as the oil is consumed, the oil-reservoir, and the wick which is connected with it, sink.

The general structure of this lamp may be understood by conceiving a flask, with a long narrow neck, and enlarged at the under part. The flask is heavy enough to swim, when it is placed in mercury, with its under part immersed. The bottom of the flask is open. The flask being placed in mercury, is made to float with its neck perpendicular. Oil is poured in at the neck till the flask is full. Then the surface of the mercury at the bottom of the flask and within the flask will be depressed by the weight of the column of oil that rests upon it; and the surface of the mercury on the outside of the bulb or lower part of the flask will stand higher than the surface of the mercury within the flask. The height which measures the difference of level of the two surfaces of mercury will be the height of a column of mercury of equal weight with the column of oil that is in the flask; and as mercury is about 14$\frac{5}{10}$ times the weight of oil, the difference of level of the two surfaces of mercury will be $\frac{10}{145}$ of the height of the oil in the flask. In proportion as oil is abstracted from the upper end of the tube by the combustion in the wick, the height of the column of oil is thereby diminished, and the two surfaces of mercury will come nearer to each other, the flask sinking a little in the mercury. As the area of the horizontal section of the lower part of the flask is much greater than the area of the section of the neck, and as the specific gravities of mercury and oil are very different, it follows, that, to restore the equilibrium after the abstraction of a column of oil from the neck, the surface of the mercury within the lower part of the flask will rise by a much shorter column.

In the lamp invented by Mr Barton, comptroller of his majesty's mint, a solution of salt and water is used as a counterpoise to the oil. The combination consists of a light flask, open at the bottom, floating in a solution of salt, so that when oil is poured into the flask, the surface of the oil in the neck of the flask stands at a higher level than the surface of the saline solution in which the flask swims. The wick is at the upper end of the neck of the flask; and as the area of the horizontal section of the bulb or lower part of the flask is much greater, suppose twenty times greater, than the area of the section of the neck of the flask, it will happen, that when a column of oil an inch high is abstracted from the neck of the flask, the height of the rise of the surface of the solution in the bulb or lower part of the flask will be only one twentieth of an inch. This lamp is represented at fig. 3, Plate CCCXXI.

T is the oil-reservoir, from which the oil passes upwards to the wicks *w*, *w*, *w*. The oil-reservoir is open at bottom, at *h* This is preferable to the mode of making the reservoir with a perforated bottom that screws off for the purpose of cleaning the reservoir. The fluid B, in which the oil-reservoir is immersed, is a solution of salt in water. This liquid is contained in a vessel RMO, which can be unscrewed at O, for the purpose of taking out the oil-vessel. N and Y are two floats fixed to the oil-reservoir and its tube. The column of the solution of salt *c*, *h*, presses against the oil at the open bottom of the reservoir, and maintains a column of oil in the tube to the height *e;* to this point *e* the wick descends, and raises the oil to the flame by the capillary attraction of its fibres. The specific gravities of the oil and the solution of salt must be inversely as the heights *c*, *h* and *h*, *e;* that is, the specific gravity of the solution of salt must be made to bear to the specific gravity of the oil the same proportion that the perpendicular height *e*, *h* bears to the perpendicular height *c*, *h*. As the oil is consumed, the water enters the hole at the bottom of the oil-vessel; the surface of the water at *c* sinks, and the oil-reservoir, with the tube and wicks attached to it, sink also. The upper part of the vessel R should be of a capacity a little less than the capacity of the oil-reservoir, so that, when the water has displaced the oil, and filled the oil-reservoir, the float Y may be at the bottom of the enlarged part of the water-vessel R. To prepare the lamp, the exterior vessel is filled with solution of salt by the opening at *l;* the solution passes into the oil-vessel by the open bottom *h*, and the oil-vessel rests on the bottom of the exterior vessel. The oil is then poured in through the tube *e*. The oil passes into the oil-reservoir, expels the water, and floats the oil-reservoir, raising the surface of the water in R.

An inconvenience affecting Barton's lamp is, that the solution of salt, by the gradual evaporation of the watery part, becomes more dense, and capable of supporting a higher column of oil than it did at first. The lamp of Edelkrantz, which floats on mercury, is not liable to this inconvenience, because the mercury does not alter in density by evaporation. Both these floating lamps have the inconvenience, that the oil is made to run over at the wick by any accidental shock which depresses the floating part of the lamp.

Several lamps have been constructed, in which the oil is raised by the principle of the fountain of Hero of Alexandria, which is known as being employed to raise water in the mines of Chemnitz, in Hungary. In Hero's writings, the application of this machine to raise oil to a lamp is described. Lamps of this construction were made some years ago in Paris by Girard de Marseille. Of this kind is the hydropneumatic lamp made by King, tin and japan manufacturer, of Snowhill, London. This lamp is formed externally like a column eighteen inches high and four inches in diameter; it is made to contain oil enough to last for five or six hours. An idea of its general principle may be formed by means of the diagram at fig. 5, Plate CCCXXI. in which there is a descending tube, with a bulb A at top. The upper part of this bulb is open. The tube, at its lower part, is curved upwards, and dilated into a second bulb B. The tube contains oil, the upper surface of which is in the upper bulb A, and its other surface is in the lower bulb B. From the top of the lower bulb B a tube proceeds to the top of another bulb C, placed higher than the upper bulb A of the first tube. This third bulb C contains oil, and from the bottom of this third bulb the oil rises in a tube. At the upper end W of this tube the wick is placed. The whole machine is closed and air-tight, except at the openings of A and W; and at these openings the pressure of the atmosphere acts. Thus the column of oil contained in the first tube and bulbs A, B, presses, with its own weight and the weight of the atmosphere, on the confined air contained between the second bulb B and the third bulb C, and raises up a column of oil from that third bulb. The top of this column, so raised, is at a higher level than the top of the oil in the first tube, because the bottom of the column, which is raised, is at a higher level than the bottom of the column in the first tube. The whole machine is a syphon, in which a first column of oil of the perpendicular height AB supports a second column of oil CW, not of a greater height than the first column, but, by means of the column of air BC interposed between the two columns of oil, it is effected that the extremity W of the second column of oil is much higher than the upper surface A of the first column of oil. In the lamp constructed on this principle by King, there is a plug and valve which serve for introducing the oil, and other particular contrivances. When the oil is to be poured in, the lamp is inverted.

A lamp, of which the reservoir for the oil is in the form of a hollow ring, was contrived by Count Rumford, and is described by him in Nicholson's *Journal*, vol. xiv. 1806, p. 23. The lamp is in the centre of the ring, with which it communicates by three straight tubes, in the direction of radii of the ring. The stoppers, which close the apertures by which the oil is poured into the ring, have a small hole, which allows the atmosphere to press on the surface of the oil in the ring, and thereby permits it to flow freely to the wick. This small hole may also be placed in some other part of the ring, and not in the stopper. The ring supports an hemispherical shade of roughened glass or of gauze. These glass shades are made rough, not by grinding, but by laying a coat of powdered glass on the smooth surface of the shade, and then exposing it to the heat of a furnace, so that the powdered glass becomes adherent, and produces a rough or frosted surface. This method of frosting glass is practised in some glass-houses situated in that district of Staffordshire called the Potteries. Lamps of this construction may be suspended from the ceiling, or placed on a stand, and are now frequently used in rooms and shops in London and Paris. They are called in London French lamps.

Hooke, in his treatise entitled *Lampas*, published in 1677, describes eight contrivances for supplying oil to a lamp equably, and as long as there remains any oil in the reservoir. This he effects by different methods of counterbalancing the oil. These inventions display Hooke's ingenuity and great knowledge of mechanics, but require nice workmanship, and are not applicable to practical purposes. These counterpoises of Hooke also serve to form a vessel so that the whole liquid may be drawn from it in an equable stream, by tapping the vessel at the top, and to make the descent of the surface of a liquid and its discharge constant and equable in a clepsydra for showing the hour.

Porter's automaton lamp, constructed in London in 1784, is something similar to some of Hooke's contrivances for producing an equable supply of oil to the wick as long as there remains any oil in the reservoir. It does not require such delicacy of execution as Hooke's counterpoised lamps. Porter's lamp is a tin box, the vertical and longitudinal section of which is a rectangular parallelogram, elongated horizontally, of which call A, B the two upper angles, C, D the two lower. This parallelopipedal box is suspended on an axis near the upper surface of the box, at a place which may be denoted by X. The axis is nearer A than B; at A is the wick, and a tube going down to the bottom of the box, along the side of the box AC. When the box is full of oil, then the space XB, behind the axis, being full of oil, counterpoises the shorter space XA. AB, the long side of the box, is horizontal; and the line drawn from the axis of suspension down to the centre of gravity is perpendicular to AB. But when the surface of the oil falls below the axis, then the box turns on its axis, the side A falls, and B is elevated; A being heavier, by reason of the wick and wick-tube, and the side AC assumes a lower position, in proportion as the oil is consumed; the line drawn from the axis down to the centre of gravity becoming more and more oblique to AB. The operation of this lamp depends upon the position of the axis X, and the weight of the wick-tube, which must be accurately proportioned, the one to the other, by trial.

LAMPS FOR LIGHT-HOUSES.

Light-houses are now generally lighted with Argand lamps, which have hollow cylindrical wicks placed before reflecting mirrors. Several of these lamps are fixed on a frame, and protected from the weather by glass windows. The lamps of light-houses are fed with oil, and in some places with pit-coal gas, as in a light-house near Trieste.

In many of the light-houses on the British coast, the frame on which the lamps are fixed is made to revolve by means of clock-work, so that to a spectator situated in the circle of which the light-house is the centre, the light appears at its brightest at the end of a stated period of time, which is generally one or two minutes. The revolving of the light enables seamen to distinguish the light-house from the light of lime-kilns or other fires upon the coast. This distinction is of great importance; for shipwrecks have happened in consequence of mistaking the light of lime-kilns for the light of a light-house. The light is in some light-houses made of a red tinge, to distinguish it from some other light-house not far distant. The red colour of the light is produced by placing windows of red glass before the lamps. Red is the only colour that can be given to the light in this way. When stained glass of other colours is placed before the lamp, it is not found to produce a change in the colour of light seen at a distance; the blue or green colour of the glass becomes insensible when seen through a great body of air, which has itself a blue colour.

LAMPS FOR LIGHTING STREETS.

Till within the last six years, the street-lamps used in London and in other parts of Britain consisted almost uniformly of a deep inverted bell-shaped glass lantern, blown of one piece, and suspended by the edge in an iron ring, with a tin conical cover perforated to give issue to the smoke, and within the lantern a flat oil-vessel, with two or more wick-holders or beaks projecting from its circumference. Many districts of London are lighted with lamps of this form; other districts employ several kinds of street-lamps of a different form. The first of these new kinds was made under the direction of Lord Cochrane, and employed to light the streets in the parish of Saint Anne, Soho, London.

The lanterns which serve to protect the light from wind and weather in the new lamps in one district of London, are composed of four lateral panes and a bottom of glass, joined together by sheet iron, so that the lantern is in form of a truncated pyramid, inverted like the lanterns of the street-lamps in Paris. In lanterns of this form some light is intercepted, and a shadow is thrown on the street by the metal that unites the panes. This defect does not occur in the lanterns of street-lamps most commonly used in England, and made of one piece of glass blown into the form of a spheroid. The spheroidal lanterns deflect the light more, because they are more unequal in thickness, but this is a smaller inconvenience; the lanterns blown of one piece of glass are more easily cleaned. Many of the lanterns for gas-lights are also made of panes in the above-mentioned form; some are cylindroids blown of one piece, with a hole in the bottom to admit air. In some of the new lamps in London which have lanterns of one piece of glass, the form of the lantern is nearly cylindrical; in others the lantern is not so deep as the lanterns of the old form. The new lamps have reflectors placed above the light, for the purpose of reflecting the light downwards on the foot pavement. These reflectors are of various forms in some of the lamps, the four plane surfaces of the inside of the pyramidal cover of the lantern are made bright, and serve to reflect the light downwards. In other lamps the ceiling of the lantern is a reflector in form, having a small portion of a large curved surface, with a chimney in the middle to give issue to the smoke. Others have two, and sometimes three, concave conoidal reflectors, whose vertices meet over the light, the axes of two of the reflectors being parallel to the direction of the street; at the point where the reflectors meet there is a chimney, through which the smoke ascends. The reflectors require to be frequently wiped in order to keep them bright.

The oil-vessels of the new lamps in London are of various forms; the beak or part of the oil-vessel under the wick is made as narrow as possible; for as it is very near the flame, its shadow thrown on the street by the rays diverging from the flame is several feet in breadth. If the beak be an inch broad, and situate an inch under the flame, the shadow of the beak on the pavement under the lamp will be ten feet broad if the flame is situate ten feet above the pavement. In some of the new lamps the reflector placed above the light is made with its concavity so disposed at the edges that the reflected light is thrown upon that part of the pavement which is under the oil-holder. In Major Cochrane's lamps the oil-vessel consists of a bird-cage fountain reservoir, which allows a supply of oil to come down to the wick when the surface of the oil in which the wick is placed has sunk to a certain point. The wick is double, consisting of two pieces of flat cotton web; between the wicks is a slit, through which a current of air ascends to the flame; on the outside of each wick is another slit; and these slits admit currents to the exterior surface of the wicks. Each time that the lamp is trimmed two pieces of wick are inserted, just sufficiently long to last the time that the lamp is required to burn. Naphtha distilled from pit-coal is burned in these lamps, and the light is brilliant like the light of coal-gas. But the gas-lights have the advantage of being unencumbered by the opaque substance of the oil-vessel, which intercepts light, and casts a shadow on the street.

The street-lamps in London are fixed at the end of iron rods which project from the walls of the houses. The lamp is, over the middle of the foot pavement, ten feet from the ground. There is a row of lamps on each side of the street, the principal streets being fifty feet in width. In Paris, where many of the principal thoroughfare streets are not above twenty-five feet in breadth, the lamps are suspended over the middle of the street. A strong rope is made fast to the walls on each side of the street, and to this rope a smaller rope with the lamp is attached. The smaller rope passes over pullies, and its end comes down into an iron box, where it is fixed on a hook. The iron box is unlocked, and the lamp is let down and lighted with a candle. The light is placed before a silver-plated reflector. In Vienna, the street-lamps are fixed on the upper end of a post. The lamp is taken out of the lantern by means of a pole, and lighted at the foot of the post. This saves the inconvenience which results to passengers from the mode of lighting lamps by a man with a ladder and torch, as practised in Britain. In most of the towns of Italy the streets are but sparingly lighted. The lamps are fixed at the end of iron rods which project from the walls of the houses. In some of them the light is placed in the focus of a parabolic reflector, or at the meeting of the vertices of two concave conoidal divergent reflectors situated above the light. The French, when masters of Italy, made regulations to improve the lighting of the streets.

In England, whale-oil is used as the combustible material in the street-lamps; of late naphtha, obtained from the distillation of pit-coal, has been used in a district of London which is lighted with Major Cochrane's lamps. This naphtha is a clear and colourless liquid, and is found to give a good light; it requires to be prepared with particular attention; that made at the gas-light work is said to be too easily inflammable. In Paris, rape-seed oil and poppy-seed oil are used; these expressed oils are made in the north-eastern part of France, and in Flanders. In the south of Europe, olive-oil of inferior quality, and walnut-oil, are used. Street-lamps lighted with the gas distilled from pit-coal were in 1821 employed in the principal streets of London, Edinburgh, Glasgow, Liverpool, Manchester, Birmingham, Sheffield, and other cities in Britain. The use of coal-gas for giving light had made very little progress in France in 1818, being scarcely employed even in Paris, and we believe not at all at Lyons, although pit-coal is abundant, and commonly used as fuel there. In 1818, pit-coal gas was used for lighting a light-house on the Adriatic, in the dominions of the house of Austria near Trieste, the gas being obtained from the coal wrought in the adjacent country.

SAFETY LAMP.

This lamp was constructed for the purpose of giving light in mines where fire-damp prevails. In many of the collieries of Britain, Flanders, and other countries, fire-damp, consisting of carburetted hydrogen, issues from different parts of the strata of coal when the coal is worked; and when the fire-damp is mixed with a certain proportion of atmospheric air, it explodes by the flame of the miner's candle, burning the workmen severely, and often depriving them of life. Vegetable substances, in the slow decomposition which takes place in them, in the process of putrefaction, give out inflammable gas. This is seen when the leaves of plants fall into water and become putrid; inflammable gas then rises to the surface in bubbles, and is inflamed if a light be applied to the surface of the water. Vegetable matter gives out inflammable gas also in the rapid decomposition occasioned by fire. The flame of vegetable substances consists of the inflammable air resulting from their decomposition, and burning with the addition of the air of the atmosphere. Pit-coal consists of the remains of large quantities of vegetable substances; and the fire-damp of coal-mines may be considered as the produce of the putrefaction which the vegetable matter has undergone, or of some decomposition that the coal is still undergoing. Sir Humphry Davy found that, on breaking some masses of coal under water, inflammable gas was given out. In some places blowers of fire-damp issue out at the surface of the earth. A quarter of a mile from Pietra Mala in the Apennines, on the road from Bologna to Florence, there is a blower of inflammable gas issuing from the ground, and proceeding from strata of schistus, and perhaps of coal. Sir Humphry Davy analysed this gas, and found it to be carburetted hydrogen, like the fire-damp of the coal mines. Another blower of the same kind exists on the side of a mountain near the shore of the Gulf of Adalia, in Lycia, on the south coast of Asia Minor. In mines wrought to obtain metals and salt, where there are no strata of vegetable matter like coal, it does not appear that the fire-damp occurs.

The merit of that very ingenious and most useful contrivance, the Safety Lamp, is wholly due to Sir Humphry Davy. After having made many experiments for the purpose of forming a lamp to give light in coal mines affected with fire-damp, without occasioning explosions, which frequently proved fatal to the miners, he found that wire-gauze, of which the apertures occupy more space than the cooling or radiating surface of the wire, so as to be permeable to air and light, offered a perfect barrier against explosion; because, although the gas was inflamed within the enclosures formed by the wire-gauze, yet the heat being communicated to the numerous surfaces of the wire, the gas on the outside of the wire enclosure was not inflamed. Wire-gauze is the best material for safety lamps, as it affords the greatest extent of radiating surface, and, by cooling, prevents all explosions that require a temperature higher than the temperature of the atmosphere. An example of the radiating and cooling action of wire is seen in the fire-guards of wire, which are hung upon the ribs of fire-places in rooms to prevent sparks from being thrown into the room. These fire-guards, although they are very near the fire, do not become hot. The apertures of the wire-gauze must be smaller, and the wire, which is the radiating and cooling surface, must be in greater quantity, in proportion as the gas in which the lamp is to be used is more inflammable. The fire-damp in coal-mines is in almost all cases carburetted hydrogen; and for excluding explosion from a lamp in that gas, it is found that the wire-gauze should contain 784 apertures in a square inch.

The wire-gauze should be of iron or copper. Fine brass wire is improper, because it is too easily combustible by reason of the zinc it contains. The iron wire should not be tinned, tin being too easily combustible. The body of the lamp should be of copper riveted together, or of massy cast brass or cast iron. The screws should fit tight; no aperture, however small, should be suffered to exist in the body of the lamp; and the trimming wire should move through a long tight tube.

The safety lamp is represented in Plate CCCXXI. fig. 4. A is the cistern containing the oil; B the brass rim to which the bottom of the wire-gauze cylinder is fastened by a screw, to prevent it from being separated from the lamp; C is the safe feeder through which oil is poured into the lamp; E the safe trimmer, a wire which passes through a safe tube, for the purpose of raising and trimming the wick; F the wire-gauze cylinder. The longitudinal suture where the two edges of the piece of wire-gauze that forms the cylinder meet, must be well doubled and fastened with wire. If the cylinder is of twilled wire-gauze, the wire should be of iron or copper, at least of the thickness of $\frac{1}{40}$th of an inch; if of plain wire-gauze, the diameter should not be less than $\frac{1}{60}$th of an inch. The number of apertures in a square inch should not be less than 786. The wire-gauze cylinder F is closed at top by a circular piece of wire-gauze, and above this is placed a second top, G, which fits on the cylinder like a cap. In the figure the circular wire-gauze top of the wire-gauze cylinder is seen at G through the wire-gauze of the cap. The circular top of this wire-gauze cap is $\frac{3}{4}$ths of an inch above the top of the wire-gauze cylinder F. I I are thick wires surrounding the wire-gauze cylinder, to prevent it from being bent by external force. K is a ring to hang up the lamp, or to hold it by. The most convenient size for the safety lamp is a span, that is, from 8 to 10 inches high, the wire-gauze cylinder being 2 to 2½ inches in diameter.

The wire-gauze, when choked with coal-dust, requires to be cleaned by means of a brush, in order to transmit the light.

In figure 4, a lens of glass, L, is placed before the light; sometimes a piece of tin is placed within the cylinder to act as a reflector.

The light of the safety lamp, without a reflector, was found to be nearly equal to the light of a common miner's candle.

Flame produced by the combustion of explosive gases may be extinguished by colder metal. The temperature of metal, even when heated to a white heat, is less than the temperature of flame, and therefore red-hot wire-gauze in sufficient quantity, and of the proper degree of fineness, will abstract sufficient heat from the flame of carburetted hydrogen or fire-damp to extinguish that flame.

Flame, in all cases, is considered to be the combustion of an explosive mixture of inflammable gas and air. If a piece of wire-gauze is held over the flame of a lamp, it prevents the flame from passing. The air that passes through is very hot, and is in the state of an explosive mixture, for it will be inflamed if a lighted taper be presented to it. But it is cooled below the exploding point, by passing through the wires, even if the wires are red hot; it is also cooled by being mixed with a considerable quantity of air comparatively cold. The temperature of visible flame is very high, as is seen by the fusion of a small filament of that difficultly fusible metal platinum, which happens when the filament is held in the flame of a candle. A considerable mass of heated metal is required to inflame fire-damp. An iron wire of $\frac{1}{20}$th of an inch in diameter, and 8 inches long, red hot, when held perpendicularly in a stream of fire-damp, did not inflame it. But wire of the same size, when six inches of it were red hot, and when it was held perpendicularly in a bottle containing an explosive mixture, so that successive portions of the gas were heated by the wire, produced an explosion.

The action of the safety lamp may be exhibited in the chemist's laboratory, by pouring some ether into the bottom of a large jar; the vapour of the ether mixing with the air, produces an explosive atmosphere. When the safety lamp is lighted and placed in the jar, the explosive mixture from the ether will burn within the wire-gauze lamp, without inflaming the gas that is without it.

The workman who has only a single gauze lamp, and finds the temperature of the wire increasing rapidly by the fire-damp from a blower, can easily diminish the heat by standing between the current and the lamp, that is to say, to the windward of the lamp, or by sheltering the lamp from the current by interposing his clothes; or, by bringing the lamp nearer the orifice from which the fire-damp issues, he may extinguish it. There never can be any occasion for the workmen to place the lamp in the exact place, when two currents, one of common atmospheric air, and the other of fire-damp, meet each other.

When the fire-damp is inflamed in the wire-gauze lamp, coal-dust thrown into the gauze cylinder burns with strong flashes; but the explosion is not communicated to the external fire-damp by this means.

Phosphorus, sulphur, pyrites, or gunpowder, would produce explosion by being applied to the outside of the wire-gauze cylinder; and sulphur, to produce this effect, must be applied in large quantities, and blown upon by a current of atmospheric air. But there is little danger of these substances being accidentally applied to the safety lamp in mines.

When a wire-gauze lamp is made to burn in a very explosive atmosphere at rest, the heat of the wire-gauze, when the fire-damp is burning within the lamp, soon arrives at its maximum, and then diminishes. The coally matter also, from the decomposition of the oil, chokes the upper apertures of the wire-gauze, and thus gradually diminishes the heat, by diminishing the quantity of gas consumed. Wire-gauze lamps which had been used by workmen for several months, and which had been often red hot in explosive atmospheres, were nevertheless still unimpaired and perfect.

Where the lamp is placed in a current of explosive gas, a greater heat is produced; and in this case the radiating or cooling surfaces should be increased. Twilled gauze or a double or triple fold of wire-gauze on one side of the lamp, or a skreen of metal between the lamp and the current, or a semi-cylinder of glass or mica within, answers the object of preventing the heat from rising to redness.

If the heat of the iron wire-gauze rose to that of a strong welding heat, a circumstance which never could happen in a colliery, then the iron wire would burn, and the lamp would be no longer safe.

From a mine of Lord Durham's there is a violent blower of fire-damp conveyed to the surface, upon which the following experiment was made: A brass pipe was fixed upon the blower-tube, so as to make the whole stream of fire-damp pass through an aperture of less than half an inch in diameter. The fire-damp, when inflamed, issued from this with great violence and noise, forming a flame of five feet long. This blow-pipe was exposed at right angles to a strong wind. The double gauze lamps soon became red hot at the point of action of the two currents; but the wire did not burn, nor did it communicate explosion. The single gauze lamp did not communicate explosion as long as it was red hot, and slowly moved through the currents; but when it was fixed at the point of the most intense combustion, it reached a welding heat; the iron wire began to burn with sparks, and the explosion then passed.

In other experiments on this blower of fire-damp, single wire-gauze lamps, with slips of tin-plate on the outside or in the inside, to prevent the free passage of the current, and double lamps, were exposed to all the circumstances of the blast; but the heat of the wire never approached near the point at which iron wire burns, and the explosion was not communicated. The flame of the fire-damp flickered and roared in the lamps, but did not escape without the limits of the wire-gauze.

The sparks from a flint and steel mill, a machine which sometimes has been used to give light in mines affected with fire-damp, would most probably inflame such a current as the blower above mentioned; because the sparks elicited from steel by the collision of flint, are small portions of the steel in a burning state, as may be seen by collecting these sparks on a sheet of paper, and viewing them with a microscope.

The *lamp without flame*, which is sold as an object of amusement and curiosity, consists of a fine wire of platinum of the $\frac{1}{100}$th of an inch in diameter, coiled into a spiral, and placed round the wick of a lamp fed with the spirit of wine, and a little above the wick; when the flame of the lamp is blown out, the heat which the wire has acquired is sufficient to keep up the slow combustion of the vapour of the spirit of wine, and this combustion continues to keep the platinum in an ignited state. The principle of this lamp without flame may be usefully applied to the safety lamp. By hanging some coils of fine wire of platinum above the wick of the lamp, it is believed that the coal-miner will be supplied with light in mixtures of fire-damp, which, from the small proportion of atmospheric air, are no longer explosive; and should the flame of the lamp be extinguished by the quantity of fire-damp, the glow of the incandescent platinum will continue to give light, and the incandescence will cease when the air becomes unrespirable. Sir Humphry Davy found, that a spiral wire of platinum of the $\frac{1}{60}$th or $\frac{1}{70}$th of an inch in diameter, suspended within the safety lamp, yields light in a mixture of fire-damp with atmospheric air, in which the atmospheric air is in so small a proportion that the mixture is not explosive. In this situation, the heat is not sufficiently great to produce combustion with flame, and combustion without flame takes place. The platinum wire, heated by the flame of the lamp, retains its heat after the flame is extinguished, and this heat is sufficient to occasion a slow combustion or combination of the elements of the fire-damp with the oxygen of the atmospheric air: this slow combustion produces sufficient heat to keep the platinum in a state of ignition. Platinum and palladium are the only metals found to produce this effect, because these two metals are of a slow conducting power and capacity for heat. This phenomenon takes place in mixtures of gas where there is common air enough to support the respiration of human beings.

At Wallsend, and other extensive collieries near Newcastle, in Northumberland, the following regulations respecting the safety lamps are observed: A steady man is employed to take charge of the lamps, and he is responsible for keeping them in good order. A chamber is allotted him, in which he keeps oils, cotton, and spare lamps; the chamber is in a secure part of the mine, as near the workings as possible. The brass collar of the wire-gauze cylinder is secured to the bottom of the lamp by a lock, which can be opened only by the lamp-keeper; so that the workmen cannot separate the wire-gauze cylinder from the bottom of the lamp. After finishing their day's work, the colliers bring the safety lamps to the lamp-keeper's cabin. The lamp-keeper unlocks the lamps, keeps the bottom, and allows the colliers to take the wire-gauze cylinders home for the purpose of cleaning them. When the colliers return to their work next day, the lamp-keeper, having replenished the lamps with oil and cotton, lights the wicks, screws on the gauze cylinders, and examines them carefully; if any defect appears in the gauze, the lamp is set aside to be repaired. The lamp-keeper's business, during the day, is to walk leisurely through amongst the workmen, carrying some spare lamps with him to replace those which happen to be extinguished.

LAMPADARY, an officer in the ancient church of Constantinople, so called from his employment, which was to take care of the lamps, and to carry a taper before the emperor or patriarch when they went to church or in procession.

LAMPEDUSA, an island of the Mediterranean Sea, belonging to the kingdom of Naples. It stretches from east to west, and is thirteen miles and a half in circumference, with a level surface, except to the south-east, where it shelves from a height of 400 feet to a low shore, indented, or rather serrated, with many caves, of which the largest is called the harbour; and the island is entitled to notice, because it was proposed to retain this port at the time Bonaparte disputed our demand to retain possession of Malta after the peace of Amiens. It has few inhabitants, though an attempt was made to establish a colony during the late war, which has since been abandoned. The chief products are fire-wood and fish. It is ten miles from Tripoli, and seventy-five from Malta. The castle at the harbour is in longitude 12. 35. 10. east, and in latitude 35. 29. 19. north.

LAMPRIDIUS, ÆLIUS, one of the writers of the Augustan History, who lived at the beginning of the fourth century, during the reigns of Diocletian and Constantius, to whom he dedicates his work. The Augustan History is composed by six different authors, and contains a series of biographical sketches of the Roman emperors, from Hadrian to Carus and his sons (117–285, A. D.). These authors were, Ælius Spartianus, Vulcatius Gallicanus, Trebellius Pollio, Flavius Vopiscus, Ælius Lampridius, and Julius Capitolinus. Lampridius wrote the four lives of Commodus, Diadumenus, Heliogabalus, and Alexander Severus. He seems to have been more attentive to the accuracy of his facts than to the beauty of his style. It is supposed by Vossius (*De Hist. Lat.* ii. 7), and by Fabricius (*Biblioth. Lat.* iii. 6), that Lampridius and Spartianus are the same writer; but this opinion has been ably refuted by Demoulines. (See Moller, *Diss. de Æl. Lampridio*, Altorf, 1688; Casaubon, *ad. Spart. Adrian.*)

LAMPRIDIUS, *Benedict*, of Cremona, a Latin poet of the sixteenth century. He taught Greek and Latin at Rome and at Padua, until he was invited to Mantua by Frederick Gonzaga to undertake the tuition of his son. He wrote epigrams and lyric verses, both in Greek and Latin, which were printed separately, as well as amongst the *Deliciæ* of the Italian poets.

LAMPSACUS, or LAMPSACUM, in *Ancient Geography*, a considerable city of Mysia, more anciently called *Pityea*, because abounding in pine trees. It is situated at the north extremity or entrance of the Hellespont into the Propontis, with a commodious harbour opposite to Callipolis, in the Thracian Chersonesus. It is still called *Lampsacus*. Long. 28. E. Lat. 40. 12. N.

LAMPONG, a district of country in the southern extremity of the island of Sumatra, which begins on the west coast at the river Padanggoochie, and extends across the island as far as Palembang on the north-east side, at which place the settlers are mostly Javans. On the south and east sides it is washed by the sea, having several ports in the straits of Sunda, particularly Keyser's and Lampong Bays. It is intersected by the great river Sulangbawang, which rises from a considerable lake between the ranges of the mountains. The rivers overflow their banks in the rainy season; and the villages situated on the higher grounds appear like islands. The western parts are mountainous, and some of the peaks are visible at a considerable distance from the sea. The central and mountainous parts of the country are best inhabited, the people being secured from the inroads of their eastern neighbours the Javans. Of all the Sumatrans, the inhabitants of this district bear the strongest resemblance to the Chinese, particularly in their round faces, and the oblique direction of their eyes. Their women are esteemed fair and handsome, and an extraordinary degree of freedom is allowed between the sexes. They have been mostly converted from the Mahommedan religion, and there are mosques in almost all their villages; but their attachment to their old superstitions still leads them to regard with a peculiar veneration the burying-places of their fathers, which they piously adorn. Some of these inland people pay a kind of adoration to the sea, whose irresistible power is often felt on the coasts of India, and in the islands in the midst of these seas, on whose shores tremendous surfs, from the wide expanse of the Pacific Ocean, are constantly breaking, and rise frequently to the greatest height, without any apparent cause. The Dutch claim the dominion of the country; and towards the end of the eighteenth century an officer was sent to the bay of Lampong, from Batavia, to fix on a favourable situation for a fort, barracks, and storehouses. The bay of Lampong affords good anchorage, being wide and deep.

LANARK, the head burgh of the county of that name, is situated on an eminence half a mile from the Clyde, on its northern bank, at the distance of thirty-two miles west from Edinburgh, and twenty-five miles south-east from Glasgow. The derivation of the name has been the subject of much dispute, and is still involved in doubt. Lanark is one of the most ancient towns in Scotland. It appears to have been of considerable importance as early as the tenth century; for the first parliament ever held in Scotland was assembled here by Kenneth II. in 978; and at the royal castle of Lanark, the charter of William the Lion in favour of the town of Ayr was dated, in 1197. It was also the scene of the first military exploit of Sir William Wallace, who there slew the English governor for his cruelty and oppression, and in the neighbouring rocky fastnesses raised the standard of deliverance.

Lanark was originally erected into a royal burgh by Alexander I. There were several subsequent charters granted by other kings; but the last one, confirmatory of all the rest, was given by Charles I. in 1632.

Till the beginning of the present century, Lanark presented a mean and deserted appearance, and was said to be a "finished town;" but the rapid increase of the cotton manufacture at Glasgow, of the benefit of which Lanark reflectively enjoys a portion, has done much in reviving a spirit of improvement. The old houses are being rapidly modernised, and many new houses have been added. A branch of the Commercial Bank has been established, and a handsome house erected for the accommodation of their agent. A new jail and splendid county buildings have been erected, reading-rooms instituted, and many other indications of growing prosperity and wealth are manifested in a marked manner.

The staple occupation, previously to the introduction of the cotton manufacture, was the making of shoes and stockings; but latterly these manufactures have been mostly limited to the consumption of the district. About 700 persons are engaged in weaving, and about 100 in shoemaking.

Lanark, along with Hamilton, Airdrie, and Falkirk, sends one representative to parliament. The municipal government is vested in a provost, two bailies, and fourteen councillors.

The population of the burgh in 1794 was 2000, in 1831 it was 4266, and it must have increased considerably since that period. The population of the parish in 1831 was 7672.

Lanark, *New*, a manufacturing village, the most extensive for spinning cotton in Scotland. It is situated on the northern bank of the Clyde, a little below the celebrated falls, and about a mile distant from the town of Lanark. It was erected about the year 1785, by Mr David Dale, an enterprising and benevolent individual.

New Lanark afterwards came into the possession of Mr Robert Owen, son-in-law of its founder, who, by his exertions in the cause of education, brought the establishment into great notoriety. Mr Owen, in the prosecution of the grand object of his life, was, fortunately for his reputation as a philanthropist, early led to perceive the benefits to be derived from receiving infants into his educational institution; and thus originated that system which subsequently attracted so much attention. Messrs Walker and Company, the present proprietors, continue the infant school, and give gratis instruction to the more advanced children belonging to the village, in all the more useful branches of education; and the regulation adopted by Mr Owen, that no child under ten years of age, and who cannot read and write, and understand accounts, shall be received into the work, continues to be strictly enforced.

About fifteen years ago one of the mills was burned down; but in 1835 the proprietors rebuilt it on a greatly enlarged scale, and, it is said, are about to fit it up as a power-loom weaving factory. A gas-work has also been completed, on a scale sufficiently adequate to light up both the works and the village.

The population of New Lanark, about ten years ago, was 2260; but, according to the returns of 1831, the number was then reduced to 1901. It is now (1836) farther reduced to 1850 souls, of whom about 1100 are employed in the works. Owing to the improvements in machinery, more work is now performed by these than was done by 1500 or 1600, the number employed at the period of its greatest population. Besides, it is worthy of remark, as a greater triumph of machinery, that in the change thus effected, the number of men required has been greatly reduced, and their places occupied by women and boys.

The people of New Lanark are better informed, and their moral character and general deportment rank higher, than usually obtains amongst those of their class.

The situation of the village is low, but the cleanliness of its spacious and well-ventilated streets gives an idea of comfort exceedingly gratifying to the stranger, and must be highly conducive to health.

LANARKSHIRE, or Clydesdale, a county in Scotland, situated between 55. 20. and 55. 56. north latitude, and 3. 25. and 4. 22. west longitude. It is bounded on the north by the counties of Dumbarton and Stirling, on the east by those of Edinburgh, Linlithgow, and Peebles, by Dumfriesshire on the south, and by the counties of Ayr and Renfrew on the west. In length, from north to south, it is about forty-seven miles; its greatest breadth, from east to west, is thirty-two, and it extends over 942 square miles, or 602,880 English acres, of which about 271,000 acres are under cultivation. It is divided into three wards; the *Upper*, of which Lanark is the chief town, containing about two thirds of its area, on the east, south, and south-west, the greater part mountainous; the *Middle*, which has the town of Hamilton in its centre, stretching along the west and north; and the *Lower*, containing the city of Glasgow, and a small tract around it.

This extensive district presents great variety of surface. Some of the mountains in the Upper Ward, where it is bounded by Dumfriesshire, are about 3000 feet high; and Tintock, on the northern boundary of the hilly district, is nearly 2300. Leadhills, a village on its southern extremity, is 1564 feet above the level of the sea, being the highest inhabited ground in Scotland. But in proceeding along the banks of the Clyde north from Tintock, the face of the country softens down to gentle elevations and depressions, and for twelve miles the river winds slowly through fertile haughs. The Middle Ward is much less elevated, few of the heights being little more than 700 feet above sea level; the town of Hamilton is only about eighty; yet there are no plains of any extent except along the banks of the Clyde, and a considerable part of the surface is covered with moss, in many places to a great depth. Of the Lower, the greater part is a highly ornamented district, particularly the banks of the Clyde, which are thickly planted with villas, the summer residence of the wealthy inhabitants of the city of Glasgow.

The principal river, and, in a commercial point of view, the greatest in Scotland, is the Clyde, from which the county is frequently called *Clydesdale.* It has its rise in the ridge of mountains which separate Lanarkshire from Dumfriesshire, and, flowing first north and then north-west, through the middle of the county, falls into the frith of the same name above Greenock, carrying with it the waters collected from 1200 square miles. The principal streams which join it on the south are Duneaton, Douglas, Nethan, Avon, and West Calder; and on the north the Medwin, Mouse, South and North Calders, and Kelvin, which separates Lanarkshire from Dumbartonshire. The Clyde is navigable to Glasgow for vessels of more than 300 tons burden, and drawing thirteen feet water; and two miles higher up for smaller vessels. Most kinds of the fish found in the other rivers of Scotland are also found in the Clyde; but it is supposed that the great increase of trade on the river, and the use of the water for the various purposes of manufacture, have been injurious to the fisheries.

Sandstone and limestone are the prevailing rocks in the lower parts of Lanarkshire, and argillaceous schistus in the high grounds. In the Cathkin Hills, near Glasgow, there is a number of basaltic columns, more than forty feet high, inclined at an angle of about seventy degrees. Ironstone abounds in many parts of the county, and is wrought to a great extent, there having been nineteen furnaces in operation in 1835, producing 56,000 tons of iron annually, exclusive of six furnaces in preparation, calculated to make 13,000 tons additional, being more than three fourths of the whole quantity made in Scotland. The great increase in this manufacture has been partly attributed to the hot-blast invented by Mr Neilson of Glasgow, first tried on a large scale in the Clyde iron-works, and immediately thereafter adopted at the Calder works. The use of this improvement is rapidly extending, and is likely to effect a most beneficial change on the production of this valuable metal. On the southern extremity are the well-known lead-mines belonging to the Earl of Hopetoun, from which the village of Leadhills takes its name. These mines now yield annually only 700 tons of lead, being less than the half of the quantity produced during the war. This deficiency is attributed solely to the want of demand, the ore being still found in abundance. A manufactory of small shot was established about two years ago. In the same quarter gold was discovered in the time of James III., and afterwards collected in considerable quantities, from which the celebrated "bonnet pieces" of James V. were coined. But coal is by far the most important of its mineral treasures. It is supposed to stretch throughout an area of about 70,000 acres, and, including the different seams, to be about ten feet thick. The field near Glasgow contains eight seams, one of them seven feet thick, the whole amounting to upwards of thirty feet. There are several good seams of cannel or candle coal in different parts of the county. This kind has been long used by the country people for lighting their houses, and is now carried in great quantities to Glasgow and other towns, for the manufacture of gas.

The valued rent of Lanarkshire is L.162,118. 16s. 10d. Scots, and the real rent of lands, houses, mines, and quarries, is L.751,364. 1s. 2d. About two thirds of the county is the property of great landholders, but small properties are very numerous. The number of landholders above L.400 of valued rent is about seventy; and below that sum and above L.10, upwards of 750. These small estates, with those of many of the class immediately above them, are cultivated by their owners; the large ones are let out to tenants on leases, except the enclosed grass lands, a great part of which is let out from year to year for grazing only.

The arable land is for the most part divided into farms of a moderate extent, held on leases for nineteen years; but it is not an uncommon practice to let the grazing lands for two or three crops only, for which a high rent is often obtained. The sheep pastures in the mountain districts yield a rent averaging about two shillings and ninepence per acre, and the arable land about twenty shillings, the best in general being only cultivated. In the lower portion of the Upper Ward, where cultivation is more indiscriminate, the average is not much higher; but in the Middle and Lower Wards the average of arable land may be computed at thirty shillings. Much of the arable land in the first division is dry and fertile; clay prevails in the second and third; and along the banks of the Clyde there are considerable tracts of an alluvial description. Of late years much land has been reclaimed and improved by draining; and incalculable benefit has been derived from the planting of clumps and strips of trees in exposed situations, although this practice has not yet become so general as its importance obviously demands. The present system of entails, under which a great proportion of the land in this county is held, has been much blamed for retarding such improvements.

As this county slopes to the west almost throughout its whole extent, the Atlantic exerts a powerful influence on its climate. For about two thirds of the year the wind blows from the south-west and west. Intense frosts are of short duration, and snow seldom lies long in the lower districts; but, from the general humidity of the atmosphere, and also of the soil, seed-time and harvest are often late. In regard to heat, there is a considerable difference between the Upper and Middle Wards, the thermometer on the same day commonly standing several degrees higher in the latter than in the former. Its range is from eleven to eighty-five degrees. The quantity of rain that falls at Glasgow varies from fourteen and a half to twenty-eight and a half inches, the average for thirty years being twenty-two and a third; but at Lanark the influence of the Atlantic is less sensibly felt, owing probably to its open and elevated situation. This however may, equally with the great humidity of the other wards, account for the lateness of the harvest. Lanarkshire is therefore, upon the whole, less favourable to the culture of corn than the eastern counties of Scotland.

The dairy is accordingly an object of considerable importance here, and is carried on in all its branches. Besides the dairies kept in and near the city of Glasgow, for supplying the inhabitants with milk, cream, and fresh butter, a great number of cows are kept in the landward districts, the produce of which is applied to making butter and cheese, and the fattening of calves. The cheese is in general equal in quality to the best Dunlop, and brings the highest prices in the Edinburgh and Glasgow markets. Lesmahagow and Carnwath parishes are said to produce the best. Within the last few years several of the Highland Society's prizes for the best imitation of Stilton and double Gloucester cheeses have been obtained by the dairy farmers of the latter parish. The Ayrshire breed of cattle has hitherto been most prized; but a new species has recently been introduced, and found to be of superior quality, viz. the Lanarkshire newly-improved breed, crossed by the Ayrshire cow and short-horned bull, or *vice versa*. The draught-horses of Clydesdale have long been famous. They are supposed to have originated from some Flanders or Holstein horses brought over in the seventeenth century by one of the Dukes of Hamilton.

From the earliest period, Clydesdale has been celebrated for its fruit. The Venerable Bede, who flourished in the eighth century, speaks of the "apple-yards of Lanark" as being then famous. Till the beginning of the present century, however, the orchards seem to have been principally confined to sloping banks, and acclivities inaccessible to the plough. But the growing prosperity and wealth of Glasgow, and the obstructions to continental intercourse about the period above alluded to, operated a change so favourable, that some of the richest holm lands were speedily devoted to this species of cultivation. It is estimated that there are at least 600 acres in orchards, which are gradually extending, although the reduced value and the precariousness of the crop seem to hold out little inducement. The average value of the fruit at the orchards during the war was about L.8000 per annum, but of late years it has not exceeded L.5000. The average price of apples at the orchards in 1835 was under two shillings per sack of about forty pounds. Gooseberries and currants are likewise largely cultivated. In some of the more extensive orchards, they yield L.50 or L.60 annually.

The internal communication by means of roads is in a high state of improvement. The great line of road from Glasgow to Carlisle and London intersects the whole county from east to west; and in every direction it is traversed by roads in the best state of repair. But other modes of communication have been found requisite for the immense trade carried on in Glasgow and the neighbourhood. The navigation of the Clyde has been much improved by deepening and confining the bed of the river, and by canals formed in several directions. These are, the Forth and Clyde Canal, connecting the friths of these two rivers, thirty-five miles distant from each other; this was the first considerable work of the kind undertaken in Scotland, and has been a very useful and successful one; the shares of L.100 were lately selling at L.540: at Stockingfield, a collateral branch proceeds to Port Dundas, at Glasgow: the Monkland Canal, from the coal-works in the parishes of Monkland, to the Forth and Clyde at Port Dundas: and the Ardrossan Canal, which is completed from Port Eglinton, near Glasgow, to the village of Johnston, a distance of eleven miles, and is intended to be continued to Ardrossan, on the coast of Ayrshire, twenty-two miles farther. Railways, too, which promise to fulfil the wonders of the nursery tale of the seven-league boots, have been projected, and some of anbrynmair.

Lancashire.

them executed. The Kirkintilloch Railway stretches from the canal into the coalfields of Monkland. The Garnkirk Railway is the only one on which locomotive engines are employed. It extends from Glasgow to near Airdrie, where it is joined by the Ballochney Railway. The Wishaw and Coltness Railway, partly executed, is intended to open this mode of communication to near the centre of the county; whilst one on a more extensive scale is in contemplation for connecting the cities of Edinburgh and Glasgow. In short, railways, which seem as yet in their infancy, are now being pushed out in all directions from the great emporium of the west, and will no doubt thrive under the fostering enterprise and industry of that great city.

The city of Glasgow, with its manufactures and commerce, has been described in the article GLASGOW. The other towns are Lanark (see the article LANARK), Rutherglen, Hamilton, and Airdrie, with which may be classed the populous villages of Strathaven and Biggar, polling stations for the elections of members of parliament. Hamilton is situated on the Clyde, thirty-eight miles west of Edinburgh, and eleven south-east of Glasgow, with a population of 9513. In the neighbourhood is the seat of the Duke of Hamilton; and three miles below is Bothwell Bridge, noted for the defeat of the Covenanters, on the 22d of June 1679. Rutherglen is a royal burgh, on the Clyde, two and a half miles above Glasgow. Airdrie, situated in the parish of New Monkland, on the great road between Edinburgh and Glasgow, about ten miles from the latter, is rapidly rising into importance. It has been recognised as a burgh under the parliamentary and burgh reform acts. The population of the town in 1831 was 6594, of the parish 9867. There are a number of villages in the vicinity of Glasgow, which, by their situation, belong to that city; and several of considerable extent in different parts of the county. Amongst the latter may be mentioned Carnwath, Carluke, Douglas, Lesmahagow, Stonehouse, Leadhills, and New Lanark. The cotton manufacture, the iron-works, and the collieries, give employment to the greater part of the inhabitants of Lanarkshire. Every great establishment has a considerable village in the neighbourhood, where the workmen reside.

The county of Lanark sends one member to parliament, who is chosen by a constituency of 3634, of whom above 200 consist of the old freeholders. The city of Glasgow sends two members, chosen by a constituency of 8883; and the royal burghs of Lanark and Rutherglen, and the towns of Hamilton and Airdrie, have a share in the election of other two members; Lanark, Hamilton, and Airdrie, being joined with Falkirk, and Linlithgow and Rutherglen with Kilmarnock, Port Glasgow, Dumbarton, and Renfrew. It has one sheriff, whose jurisdiction extends over all the county, and three substitutes, at Lanark, Glasgow, and Hamilton. Lanarkshire contains forty-seven parishes, of which eleven belong to the Presbytery of Lanark, fourteen to that of Hamilton, and thirteen to that of Glasgow, all in the Synod of Glasgow and Ayr; and nine to the Presbytery of Biggar, in the Synod of Lothian and Tweeddale. The ecclesiastical revenue, exclusive of that of the churches within the city of Glasgow, including the estimated value of the glebes, may be stated, on an average of the last seven years, at about L.11,550. The increase of the population has been uncommonly rapid; but it may be attributed chiefly to the city of Glasgow, and the spread of its manufactures.

The following table exhibits an abstract of the population returns of 1831, and a comparative view of the enumerations made in 1801, 1811, 1821, and that year.

	OCCUPATIONS.			PERSONS.				AGRICULTURE.										
	Families chiefly employed in Agriculture.	Families chiefly employed in Trade, Manufactures, and Handicraft.	All other Families not comprised in the two preceding Classes.	Males.	Females.	Total of Persons.	Males 20 Years of Age.	Occupiers employing Labourers.	Occupiers not employing Labourers.	Labourers employed in Agriculture.	Employed in Manufacture, or in making Manufacturers' Machinery.	Employed in Retail Trade, or in Handicraft as Masters or Workmen.	Capitalists, Bankers, professional and other educated Men.	Labourers employed in Labour not Agricultural.	Other Males 20 Years of Age (except Servants).	Male Servants 20 Years of Age.	Male Servants under 20 Years.	Female Servants.
Upper ward......	1622	2,975	2,557	17,071	18,167	35,238	8,588	659	424	1688	2,134	1,717	244	1277	319	146	124	2,151
Middle ward.....	2084	8,248	2,510	32,268	32,477	64,745	15,364	654	799	1505	4,104	2,950	469	3586	853	339	319	2,185
Under ward......	499	1,883	533	7,166	7,244	14,410	3,523	157	63	529	1,126	547	133	766	129	73	37	551
City of Glasgow and suburbs...........	299	26,586	15,080	93,724	108,702	202,426	46,195	23	63	101	19,913	18,832	2723	574	4012	554	392	8,006
Total......	4504	39,692	20,680	150,229	166,590	316,819	73,670	1493	1349	3803	26,677	24.046	3569	6303	5318	1112	872	12,893

The population amounted in 1801 to 146,699, in 1811 to 191,752, in 1821 to 244,387, and in 1831 to 316,819.

(See Naismyth's *General View of the Agriculture of Clydesdale; Beauties of Scotland*, vol. iii.; *The General Report of Scotland;* and Playfair's *Account of Scotland*, vol. i.)

LANBRYNMAIR, a town in the hundred of Machynleth, in Montgomeryshire, in Wales, 193 miles from London. It is a sinecure rectory, in the patronage of the Bishop of St Asaph. The annual value of the real property was assessed in 1815 at L.5649. The population amounted in 1801 to 1743, in 1811 to 1657, and 1821 to 1893, and in 1831 to 2040.

LANCASHIRE, a great commercial and manfacturing county in the north-west of England. This district, which is situated between long. 2. 18. and 3. 7. W., and lat. 53. 23. and 54. 24. N., has Cumberland and Westmoreland on the north-east and north, Yorkshire on the east, Cheshire on the south, and the Irish Sea on the west. Its extreme length is about seventy-four miles, and its greatest breadth forty-four and a half; but the boundaries being very irregular, its outline is about 342 miles, which comprehends an area of 1765 square miles, or 1,129,600 acres. Lancashire forms part of the northern circuit, is situated within the province of York and diocese of Chester, and is divided into sixty-one parishes. The other divisions are hundreds, of which there are six, namely, Lonsdale on the north; Amounderness, Blackburn, and Leyland, in the middle; and Salford and West Derby on the south. Most of these are again popularly subdivided, according to their relative situation, or the names of their towns.

The greater part of this county, from Rossall Point on the north, to the Mersey on the south, except where it is indented by the estuary of the Ribble on the west, lies tolerably compact, in the form of an irregular square. To the north of Rossall Point, till it meets the county of Westmoreland, it is very narrow, with a sinuous boundary on all sides; and to the north-east there is a considerable tract called Furness, separated from the rest by extensive sands, where the river Ken, from Westmoreland, discharges itself into the Bay of Morecombe. Opposite the south point of Furness is the island of Walney, and other seven, of which the largest is Old Barrow. On the north-east and north much of the surface is occupied with hills and moors, particularly in Furness, where the highest grounds have the name of *Fells;* and also on the east, where it is bounded by Yorkshire; but the south and west quarters spread out for the most part into low and fertile tracts, though not without being interrupted by pretty large fields of moss. Chat Moss, near Worsley, and Pilling Moss, farther to the north, are the most extensive; but many other, though smaller, tracts occur in various parts. Along the coast there is also a considerable extent of sandy marsh land, particularly towards the north, near Lancaster and Warton, at the estuaries of the Leven and Duddon, in the north-east or Furness district, and about the banks of the island of Walney.

The climate of Lancashire is chiefly distinguished for its humidity. According to a register kept at Liverpool from 1784 to 1792, the least quantity of rain yearly was twenty-four and an eighth inches in 1788, and the greatest fifty-four and a fourth in 1792. At Lancaster, in the latter year, the quantity of rain was nearly sixty-six inches. Four inches have been known to fall in the course of a night. The mean heat at Lancaster, from 1784 to 1790, was 51° 8′. The prevailing winds are from the south, south-west, and north-east. As fogs are not frequent, nor the stagnant waters of any considerable extent, the climate is not insalubrious.

The soils of this extensive district are necessarily various. The higher grounds, covered with heath and broken with rocks, have a sterile moorish soil; but towards their base, and in the valleys which they form, it is for the most part of the nature of holme. Loam and clay of various degrees of consistence prevail on the flat grounds, with portions of sand, gravel, and moss; and on the banks of the rivers, and at their estuaries, there are large tracts of an alluvial description. The under stratum of the heathy grounds is sandstone or freestone of different colours; a blue rock, popularly called whinstone, is more common in the fell tracts of Furness. Limestone prevails on the north-west, and towards the eastern boundaries. This and the freestone rock occasionally come in contact with one another in a very remarkable manner, a striking instance of which occurs near the town of Chipping, at the termination of the high ridge of Longridge Fell. In some places towards the eastern border, coal approaches so near the surface, as to constitute the substratum of the soil, and may be seen cropping out at Townley Park, and on the rising grounds on both sides. Marl is frequently found below the soil in the low grounds, and also under the mosses. Much of the vale land consists of rich pastures and meadows; what part of it is under tillage is very productive, and in many instances of a quality to yield turnips and other green crops, as well as grain. A strong clayey loam, however, appears to be the predominant soil throughout the low grounds on the south and west, which, with the wetness of the climate, renders cultivation more difficult and hazardous than in many other districts.

The principal mineral substances are coal, copper, lead, and iron. The first, and in a manufacturing district by far the most important, of these, is in great abundance in several parts of the county. The great coal tract commences below Prescot on the south, and, crossing the county in a north-east direction, passes into Yorkshire; but coal abounds farther to the south-east, near Manchester, and also to the north above Lancaster. Its quality, as well as the thickness of the beds, and the depth at which it is wrought, has considerable diversity; but it is chiefly of a bituminous description. Cannel coal is found near Wigan, and at other places, and sometimes in contact with the black coal, or a little mixed with it, as at the pits near Layton Hall. Copper is met with in the rough barren mountains, towards the northern extremity of the high Furness or Fell district, particularly at Coniston, Muckle Gill, and Hartriggs; but has not been found to the south of Lancaster Sands in such quantities as to be wrought with advantage. Lead occurs towards the north and north-east parts of the county, but in no great quantity. Iron is wrought to the north of Lancaster Sands, in the liberty of Furness. Though found in other quarters, it is not in such abundance, so as to make the working of it profitable. In the northern part of the high Furness tract, quarries of blue slate have been opened. Sandstone is wrought in most parts of the county south of the Sands, and limestone, though it is found also in the Furness district, is most abundant on the Lancaster side. The main tracts of this rock are in the northern divisions above Lancaster, and near Chipping and Clitheroe, towards the borders of Yorkshire. More to the south, that is, throughout the larger and more valuable portion of the county, it occurs but seldom, and not to a great extent.

Lancashire is naturally well supplied with waters, of which its inhabitants have industriously availed themselves in their manufacturing establishments, and in facilitating the transport of their products of all kinds. The principal rivers are the Mersey, the Irwell, the Ribble, and the Loyne or Lune. The Mersey, after receiving the Etherow and the Goyt from Cheshire, and the Tame from Yorkshire, becomes a large river at the town of Stockport, and, after a winding course between this county and Cheshire, enters the Irish Sea a little below the town of Liverpool. By means of an artificial cut, it has been made navigable for vessels of sixty or seventy tons from Liverpool to the mouth of the Irwell, up which river the navigation is continued to Manchester.

The Irwell, which has its source amongst the hilly ranges to the south of Haslingden, also receives several streams, and flowing through a part of Manchester, where it is advantageously employed by the different manufactories, especially those of spinning, dyeing, and calico printing, falls into the Mersey a little below Flixton. The Ribble is a large river, which intersects the county from east to west. It enters Lancashire from Yorkshire, above the town of Clitheroe, and, flowing through the beautiful vale of Ribblesdale, joins the Irish Sea a little below the town of Preston, to which it is navigable for small vessels. The Loyne or Lune, also a large river, has its source in the fells of Westmoreland, and comes into Lancashire a little below Kirkby-Lonsdale, and, passing by the town of Lancaster, afterwards expands into a broad estuary, and empties itself into the Irish Sea, The Alt, the Douglas, the Wyer, the Winster, the Leven, the Crake, and the Dudden, are also considerable streams; and many others, though in a general description not worthy of notice for their size, afford the most important facilities to the manufactories established on their courses. There are several pieces of water in the county, known by the names of lakes, waters, meres, and tarns. Of these the most considerable is Coniston Lake or Thurston Water, and Esthwaite Water, both in Furness. With these may be mentioned the Lake of Windermere, which, though not properly belonging to Lancashire, enters it by its southern point, and forms its boundary for eight or ten miles. Mineral springs have been found at Cartmel, Flukeborough, Wigan, Latham House, near Ormskirk, and other places.

Of the canals by which a great part of this county is traversed in almost every direction, it would be difficult to give an intelligible description without references to a map, and the limits of this article admit only of noticing them very generally. The great importance of an interior communication by water had been recognised in this quarter a considerable time before any attempt was made to form one entirely artificial. The first object was to render some of the rivers navigable, as in the instance of the Mersey and Irwell, already mentioned, to effect which, acts of parliament were obtained in 1719 and 1720. But the droughts and tides which affect the navigation of these and other rivers have been found to occasion so much inconvenience, that more recently a preference has been given to channels of communication formed wholly by human labour. The first work of this description in Lancashire, and probably in England, was the Sankey Canal, from the Mersey to near St Helen's, which, including its branches, extends nearly twelve miles. It was finished about sixty years ago. Besides this canal, the county is intersected by nine others, four of which communicate with the populous town of Manchester. Of these we can only notice the more considerable. The Duke of Bridgewater's Canal, in as far as it belongs to Lancashire, commences in the suburbs of Manchester, and terminates at Pennington, near the town of Leigh. Under the town of Manchester a portion of it passes into arched tunnels, from one of which coals are hoisted up out of the barges below, through a shaft, and delivered into a large coal-yard in the main street. Before it reaches the coal-works at Worsley, it is carried under ground for three quarters of a mile. The Lancaster Canal commences at Kirkby-Kendal in Westmoreland, and terminates at West Houghton, to the eastward of Wigan, after a course of 75¾ miles. The principal object in executing this great work was to open a ready communication between the coal and limestone districts, and between the port of Lancaster and the populous towns on the north and south. It is on an average seven feet deep, and is navigable by boats of sixty tons burden. The Leeds and Liverpool Canal is of still greater length. It extends between the towns of Liverpool and Leeds, along a line of 107¾ miles, and communicating at the latter place with the Aire, which is navigable to the German Ocean, and at the former with the Mersey, which falls into the Irish Sea; the navigation is thus completed between the eastern and western seas. On this canal flats of forty-two tons are employed in the coal trade between Leeds and Wigan, and passage-boats are in constant use between these towns. The other canals, though works of great importance when each is considered by itself, are much inferior to those we have mentioned.

A considerable portion of the territory of this county belongs in property to his majesty, as Duke of Lancaster. The greater part of this consists of what is called *forest lands*, all of which are situated in the most northern parts. It is held in general on leases for thirty years, and yields but an inconsiderable revenue. A few other estates are also of considerable extent; but, generally speaking, landed property is much subdivided, and hence Lancashire has a greater number of land-owners than any other county in England, Middlesex excepted; many of the estates not affording a rental of L.200 a year, and not a few being below L.50.

Lancashire does not excel in its agriculture. Only about a fourth of its surface is computed to be under corn and other tillage crops, the other three fourths, subject to a deduction for wastes, roads, &c. being chiefly occupied in grazing and for the purposes of the dairy; and it has been estimated that it does not raise corn sufficient for the support of its population for more than three months in the year. All the different sorts of corn, however, are cultivated, and, where the soil is naturally fertile, the crops are often abundant; but turnips and other ameliorating crops are not in general use, nor always, where grown to some extent, properly attended to. Potatoes, however, are cultivated not only upon a large scale, but with great care and success; this root, with oatmeal, forming the principal food of the working classes. They were introduced into this county from Ireland, and are said to have been cultivated here long before they had found their way into most other parts of England. Lancashire was long noted for its breed of horned cattle, but a variety of other breeds have been introduced, particularly the Holderness, or short-horned, which are preferred to the Lancashire in the milk dairies near the town, and sometimes also in those at some distance, where the principal object is butter. The native breed is the kind more commonly kept for the cheese dairies, farther into the interior. A cow yields, upon an average throughout the year, from eight to twelve quarts of milk daily, or from four to six pounds of butter in the week, or from three to four hundredweight of cheese in the year. A considerable number of good horses are bred and reared, but its sheep stocks are inconsiderable, and seldom of a valuable description. Farms are in general small, and held either on short leases or without any lease at all, so that a tenant has no encouragement to invest capital in the improvement of the soil.

This district, however, is greatly distinguished by its manufactures and commerce, which afford employment to three fourths of its crowded population. Of the former, that of cotton, which is here conducted in all its branches on the most extensive scale, has long been the most considerable. The town of Manchester, where it seems to have had its origin in England, is still its principal seat, though several of the other towns, such as Preston, Garstang, Blackburn, Clitheroe, Middleton, Burnley, Wigan, Bury, Bolton, and Ashton, have a considerable share of it; and, indeed, it is more or less spread over the greater part of the county. At Ravenhead, near Prescot, plate-glass and mirrors are made to a considerable extent; brass, pewter, and copper works are carried on at Wigan and at St Helen's; Warrington has manufactures of sail-cloth, linens, and checks, with the making of pins and glass, and iron-founderies; and Rochdale and Ashton furnish a variety of the coarser articles of woollen.

From the great extent and variety of its manufactures, it is natural to infer that its commerce must be upon a scale proportionally extensive, and it is so. Liverpool, as a commercial town, is now perhaps second only to London; and to this rank it has attained from a very low beginning little more than a century ago. In prosperous times, the enterprise of its merchants exchanges the products of British capital and industry with those of almost every climate; and, at all times, it carries on an extensive commerce with America and the West Indies, and with Ireland; to which has been recently added a large share of the East India trade. The ports of Preston, Poulton, Warrington, Ulverston, and Lancaster, the county town, are chiefly employed in the coasting trade.

As a considerable portion of the people of Lancashire are employed in working up goods for a foreign market, the condition of the labouring classes, in particular, is much affected by the changes which occur from time to time in that market, and which it is not always possible to anticipate. They are sometimes in the receipt of wages more than sufficient for their comfortable subsistence, and at other times many are thrown out of employment altogether, and the rest retained at wages confessedly inadequate to their support. This is true in an especial manner of its great staple, the cotton manufacture. From this cause, and perhaps also owing to the inconsiderate habits and want of foresight which such fluctuations are apt to engender, the poor-rates of this county amounted, in 1815, to about L.400,000, whereas, forty years before, they were little more than L.50,000. Since that period up to the present time (1836), though the whole number of the inhabitants has increased nearly half a million, there has not been a corresponding increase on the assessments for the poor, but, on the contrary, a diminution, nor, except in the year 1832, has the amount quite reached that of 1815 and 1816.

The whole population of the county, at the three decennial enumerations, has been as follows:—In 1801, 672,731; in 1811, 828,309; in 1821, 1,052,859; and in 1831, 1,335,800; thus showing a doubling of the inhabitants in thirty years. The burials, including both the registered and unregistered, appear, between the years 1821 and 1833, to have been one in forty-five of the whole of the number then living. The illegitimate births bear a higher proportion to the whole births than in any other county of England, except Hereford and Shropshire, where, as in this county, they are one in thirteen, whereas in the whole of England they are only one in twenty.

According to the laborious production of Mr Rickman, the occupation of the people is thus described.

Occupiers of land employing labourers	6,658
Occupiers of land not employing labourers	9,714
Labourers employed in agriculture	20,949
Labourers employed in manufactures	97,517
Persons employed in retail trade or handicraft	86,076
Capitalists, bankers, &c	17,614
Labourers not agricultural	60,546
Other males twenty years of age	11.229
Male servants	3,825
Female servants	33,509

The largest towns in the county, and their population in 1831, were the following:

	Town.	Whole Parish.
Ashton-under-Lyne	9,222	33,597
Blackburn	27,091	59,791
Bolton	28,299	63,034
Bury	15,086	47,829
Lancaster	12,613	22,294
Liverpool	165,175	—
Manchester	142,026	270,961
Oldham	32,381	67,579
Preston	33,112	36,336
Rochdale, the town of that name, and a part of the parish, is in Yorkshire...	—	58,441
Toxteth Park, a suburb of Liverpool	24,067	—
Warrington	16,018	19,155
Wigan	20,774	44,486

By the law of 1832, called the reform bill, the borough of Newton, in this county, was disfranchised, and Clitheroe, which had two members, was reduced to one. By the same bill, the towns of Ashton, Bury, Rochdale, Salford, and Warrington, have been created boroughs, with the right of choosing one member each; and Manchester, Bolton, Blackburn, and Oldham, with the right of electing two each.

The county is formed into two divisions, for the purpose of elections. These are denominated the North, whose polling places are Lancaster, Hawkeshead, Ulverston, Poulton, Preston, and Burnley; and the South, whose polling places are, Newton, Wigan, Manchester, Liverpool, Ormskirk, and Rochdale.

LANCASTER, a town, the capital of the county of the same name, in the north of England, 239 miles from London. It is a sea-port, situated on the river Lune, along whose banks are some fine quays, on which are the warehouses of the several merchants and traders. The Lune is connected, by navigable canals, with the several rivers which run through England, by which great facilities are communicated for internal intercourse, and for dispersing the commodities which the trade of the town draws to it from America, the West Indies, and the Baltic. Lancaster is well built, and the streets properly paved. The church is a fine Gothic structure; and near to it is the castle, in which are the county jail, and the courts where the assizes are held. It is an ancient structure of the reign of Edward III.; on the top of it is a large square tower called John of Gaunt's chair, from which is a fine prospect over the surrounding country. The markets are held on Wednesday and Saturday, and are well supplied. This town is governed by a mayor, recorder, alderman, and bailiffs; and elects, as it did before the alteration, two members to the House of Commons. It formerly conferred the title of duke upon several members of the reigning family. The annual value of the real property, as assessed under the property-tax in 1815, amounted to L.34,117. The inhabitants amounted in 1801 to 9030, in 1811 to 9247, in 1821 to 10,144, and in 1831 to 12,613.

LANCAVY, or Pulo Lada, an island in the Eastern Seas, near the coast of Queda, about sixteen miles long, and from three to eight broad. Long. 96. 40. E. Lat. 6. 19. N.

LANCE, Lancea, a spear; an offensive weapon used by the ancient cavaliers, in form of a half pike. The lance consisted of three parts, the shaft or handle, the wings, and the dart. Pliny attributes the invention of lances to the Ætolians. But Varro and Aulus Gellius say the word lance is Spanish; and hence others conclude that the use of this weapon was borrowed by the people of Italy from the Spaniards. Diodorus Siculus derives it from the Gaulish, and Festus from the Greek λογχη, which signifies the same thing.

LANCET, a chirurgical instrument, sharp-pointed, two-edged, and chiefly used for opening veins in the operation of phlebotomy or bleeding; also for laying open abscesses, tumours, and the like.

LANCH, a peculiar sort of long boat, employed by the French, Spanish, and Italian shipping, and in general by those of other European nations, when voyaging in the Mediterranean Sea. A lanch is proportionally longer, lower, and more flat bottomed, than the long boat; it is consequently less fit for sailing, but better calculated for rowing, and approaching a flat shore. But its principal superiority over the long boat consists in being by its construction much fitter to under-run the cable; which is a very necessary employment in the harbours of the Levant, where the cables of different ships are fastened across each other, and frequently render this exercise extremely necessary.

Lanch, or Launch, is also the movement by which a ship or boat descends from the shore, either when she is at first built, or at any time afterwards. To facilitate the operation of launching, and prevent any interruption, the ship is supported by two strong platforms, laid with a gradual inclination to the water, on the opposite side of her keel, to which they are parallel. Upon the surface of this declivity are placed two corresponding ranks of planks, which compose the base of a frame called the *cradle*, the upper part of which envelopes the ship's bottom, to which it is securely attached. Thus the lower surface of the cradle, conforming exactly to that of the frame below, lies flat upon it lengthwise, under the opposite sides of the ship's bottom; and as the former is intended to slide downwards upon the latter, carrying the ship along with it, the planes or faces of both are well daubed over with soap and tallow. The necessary preparations for the launch being made, all the blocks and wedges by which the ship was formerly supported are driven out from under her keel, till her whole weight gradually subsides upon the platforms above described, which are accordingly called the *ways*. The shores and stanchions, by which she is retained upon the stocks till the period approaches for launching, are at length cut away, and the screws applied to move her if necessary. The motion usually begins on the instant when the shores are cut, and the ship slides downward along the ways, which are generally prolonged under the surface of the water, to a sufficient depth to float her as soon as she arrives at the farther extremity. When a ship is to be launched, the ensign, jack, and pendant are always hoisted, the last being displayed from a staff erected in the middle of the ship. Ships of the first rate are commonly constructed in dry docks, and afterwards floated out, by throwing open the flood-gates, and suffering the tide to enter as soon as they are finished.

LANCEROTA, one of the Canary Islands, situated at some distance from the western shore of Africa. It is subject to volcanoes; and one which occurred in 1730, spread desolation over a highly-cultivated region, entirely changing the face of the island. The eastern part is fertile, though sandy; and, stripped of its forests, Lancerota experiences, like the neighbouring continent, most excessive droughts. Camels are nevertheless maintained in great numbers; and corn, barley, and vegetables are exported. The vine grows with strength amongst the volcanic ashes. Teguisa is the name of the capital. This island possesses the two best ports of the archipelago; and it is much more advanced in civilization than those situated farther to the westward. The inhabitants lived in houses built of freestone, at a time when the Guanches of Teneriffe were lodged in caverns. Here is practised the singular custom likewise found in Thibet, of one woman being allowed to possess several husbands. The inhabitants of Lancerota may amount to about 10,000 in number, who export some corn, and a large quantity of dried goats' flesh; but they do not exhibit the commercial activity of those of Teneriffe. The island is about thirty miles in length by eighty in breadth.

LANCISI, John Marca, an eminent Italian physician, was born at Rome in 1654. From his earlier years he had a predilection for natural history, and studied botany, chemistry, anatomy, and medicine, with great assiduity. In 1688 Innocent XI. appointed him his physician and private chamberlain, notwithstanding his youth; and Cardinal Altieri Camerlinga made him vicar for the installation of doctors in physic, which Clement XI. gave him as long as he lived, at the same time continuing to him the appointments conferred on him by his predecessor. He died in 1710, after giving his fine library of more than twenty thousand volumes to the Hospital of the Holy Ghost for the use of the public. This noble benefaction was opened in 1716, in the presence of the pope and most of the cardinals. He wrote many works, which are esteemed, the principal of which were collected and printed at Geneva in 1718, in two vols. 4to.

LAND, in a general sense, denotes *terra firma*, as distinguished from *sea*.

Land, in a limited, sense, denotes arable ground.

Land, in nautical language, forms part of several compound terms. Thus, *land-laid*, or *to lay the land*, is just to lose sight of it. *Land-locked*, is when land lies all round the ship, so that no point of the compass is open to the sea. If the vessel is at anchor in such a place, she is said to ride *land-locked*, and is therefore concluded to ride safe from the violence of the winds and tides. *Land-mark*, is any mountain, rock, steeple, tree, or other object which may serve to make the land known at sea. The *land is shut in*, is a term used to signify that another point of land hinders the sight of that from which the ship came. *Land-to*, or the ship *lies land-to*, means she is so far from shore that it can only just be discerned. *Land turn*, is a wind that in almost all hot countries blows at certain times from the shore in the night. *To set the land*, is to see by the compass how it bears.

Land-Tax, one of the annual taxes raised upon the subject. See Taxation.

Land-Waiter, an officer of the custom-house, whose duty it is, upon the landing of any merchandise, to examine, taste, weigh, and measure them, and to take an account thereof. In some ports they also execute the office of a coast-waiter. They are likewise occasionally styled *searchers*, and are required to attend and join with the patent searcher in the execution of all cockets for the shipping of goods to be exported to foreign parts; and in cases where drawbacks on bounties are to be paid to the merchant on the exportation of any goods, they, as well as the patent searchers, are to certify the shipping thereof on the debentures.

LANDA, a town and territory of the island of Borneo, on the river Pontiana. It is the residence of the rajah, and is a strong place, well provided with artillery, and contains within its territory mines of considerable importance.

LANDAU, a canton of the province of the Rhine, in the kingdom of Bavaria. It is formed out of a portion of the former principality of Zwegbrucken, or Deux-Ponts, and is situated on the frontier of France, from which it is divided by the river Lauter. It is 558 square miles in extent, and contains eleven cities and market-towns, 126 villages, and 101,600 inhabitants. It is a mountainous and woody district, but with some rich and fertile valleys, yielding corn and cattle; but the chief produce is wood, which is floated down the Rhine, to the cities in Holland, in large rafts. The capital is the city of the same name, situated on the river Queich, one of the fortresses garrisoned by the German confederation. It is a regular and strong place, of four fronts, with eight curtains, defended by seven bastions, three redoubts, and seven lunettes, and surrounded with broad ditches. It has a citadel furnished with bomb-proof casernes and magazines, and celebrated for the sieges of 1702, 1704, 1713, and 1793. It contains 550 houses, and 4240 civil inhabitants. It has some manufactories of hemp, flax, and wool, and makers of twine, paper, hats, and hosiery. Long. 25. 47. E. Lat. 49. 11. N.

LANDEN, a town of the Netherlands, in the province of Liège and arrondissement of Huy, on the river Beake. It is remarkable for the battle fought near it, usually called the battle of Neerwinden, in 1693, in which the allies were defeated by Marshal Luxembourg. Long. 4. 55. E. Lat. 50. 45. N.

Landen, *John*, an eminent mathematician, was born at Peakirk, near Peterborough, in Northamptonshire, in January 1719. He early became a proficient in the mathematics, for we find him a respectable contributor to the *Ladies' Dairy* in 1744; and he was soon amongst the foremost of those who then contributed to the support of that small but valuable publication, in which a number of English mathematicians at one period or other contended for fame. Mr Landen continued his contributions to it under various signatures till within a few years of his death.

In the forty-eighth volume of the *Philosophical Transactions* for the year 1754, Mr Landen published an Investigation of some theorems which suggest several very remarkable properties of the circle, and are at the same time of considerable use in resolving fractions, the denominators of which are certain multinomials, into more simple ones, and by that means facilitate the computation of fluents. This paper was handed to the Society by Mr Thomas Simpson of Woolwich; a circumstance which will convey to those who are not themselves judges some idea of its merits. In the year 1755 he published a volume entitled *Mathematical Lucubrations*. It contains a variety of tracts relative to the rectification of curve lines, the summation of series, the finding of fluents, and many other points in the higher parts of the mathematics.

About the latter end of 1757, or the beginning of 1758, he published proposals for printing by subscription *The Residual Analysis*, a new branch of the algebraic art; and in 1758 he published a small tract in quarto, entitled *A Discourse on the Residual Analysis*, in which he resolved a variety of problems, to which the method of fluxions had been usually applied, by a mode of reasoning entirely new; compared these solutions with solutions of the same problems investigated by the fluxionary method; and showed that the solutions by his new method were, in general, more natural and elegant than the fluxionary ones. In the fifty-first volume of the *Philosophical Transactions* for the year 1760, he published a New Method of computing the sums of a great number of Infinite Series. This paper was also presented to the society by his ingenious friend Mr Thomas Simpson. In 1774 he published the first book of *The Residual Analysis*, in 4to, with several copperplates. In this treatise, besides explaining the principles on which his new analysis was founded, he applied it to drawing tangents and finding the properties of curve lines; to describing their involutes and evolutes, finding the radius of curvature, their greatest and least ordinates, and points of contrary fluxure; to the determination of their cusps, and the drawing of asymptotes;—and he proposed in a second book to extend the application of this new analysis to a great variety of mechanical and physical subjects. The papers which were to have formed this book lay long by him; but he never found leisure to put them in order for the press. In January 1766 Mr Landen was elected a fellow of the Royal Society, and admitted in the April following. In the fifty-eighth volume of the *Philosophical Transactions* for the year 1768, he published a specimen of a new method of comparing curvilineal areas, by means of which many areas are compared, that did not appear to be comparable by any other method; a circumstance of no small importance in that part of natural philosophy which relates to the doctrine of motion. In the sixtieth volume of the same work, for the year 1770, he gave some new theorems for computing the whole areas of curve lines, where the ordinates are expressed by fractions of a certain form, in a more concise and elegant manner than had been done by Cotes, Demoivre, and others, who had considered the subject before him. In the sixty-first volume, for 1771, he investigated several new and useful theorems for computing certain fluents, which are assignable by arcs of the conic sections. This subject had been considered before, both by Mr Maclaurin and M. d'Alembert; but some of the theorms which were given by these celebrated mathematicians, being in part expressed by the difference between an arc of a hyperbola and its tangent, and that difference being not directly attainable when the arc and its tangent both become infinite, as they will do when the whole fluent is wanted, although such fluent be finite; the theorems therefore fail in those cases, and the computation becomes impracticable without further help. This defect Mr Landen has removed by assigning the *limit* of the difference between the hyperbolic arc and its tangent, whilst the point of contact is supposed to be removed to an infinite distance from the vertex of the curve. And he concludes the paper with a curious and remarkable property relating to pendulous bodies, which is deducible from these theorems. In the same year he published an animadversion on Dr Stewart's computation of the Sun's distance from the Earth. In the sixty-fifth volume of the *Philosophical Transactions* for 1775, appeared the investigation of a general theorem, which he had promised in 1771, for finding the length of any arc of a conic hyperbola by means of two elliptic arcs; and by the theorems there investigated, both the elastic curve and the curve of equable recession from a given point may be constructed in those cases where Mr Maclaurin's elegant method fails. In the sixty-seventh volume, for 1777, he gave a new theory of the motion of bodies revolving about an axis in free space, when that motion is disturbed by some extraneous force, either percussive or accelerative. At this time he did not know that the subject had been handled by any other person; and he considered only the motion of a sphere's spheroid and cylinder. The publication of this paper, however, was the cause of his being told that the doctrine of rotatory motion had been considered by M. d'Alembert; and having purchased that author's *Opuscules Mathématiques*, he there learned that M. d'Alembert was not the only one who had considered the matter before him; for M. d'Alembert speaks of some mathematician, though he does not mention his name, who, after reading what had been written on the subject, doubted whether there existed any solid whatever, besides the sphere, in which a line, passing through its centre of gravity, would be a permanent axis of rotation. In consequence of this, Mr Landen took up the subject again; and though he did not then give a solution of the general problem, namely, to determine the motions of a body of any form whatever revolving without restraint about any axis passing through its centre of gravity, he fully removed every doubt of the kind which had been started by the person alluded to by M. d'Alembert, and pointed out several bodies, which, under certain dimensions, possess that remarkable property. This paper is published, amongst many others equally curious, in a volume of *Memoirs* which he gave to the world in 1780. But what renders that volume yet more valuable, is a very extensive Appendix, containing theorems for the calculation of fluents. The tables which contain these theorems are more complete and extensive than any which are to be found in other authors, and are chiefly of his own investigating; being such as had occurred to him in the course of a long and curious application to almost every branch of the mathematical sciences. In the years 1781, 1782, and 1783, he published three little tracts on the summation of converging series, in which he explained the extent of some theorems which had been given for that purpose by Demoivre, Mr Sterling, and Thomas Simpson, in answer to some things which he thought had been written to the disparagement of these mathematicians.

About the beginning of the year 1782 Mr Landen had made such improvements in his theory of rotatory motion, as he thought would enable him to give a solution of the general problem specified above; but finding the result to differ very materially from that of the solution which had been given by M. d'Alembert, and not being able to see clearly where that gentleman had erred, he did not venture to make his own public. In the course of that year having procured the Memoirs of the Berlin Academy for 1757, containing M. Euler's solution of the problem, he found that it gave the same result as had been deduced by M. d'Alembert; but the perspicuity of M. Euler's manner of writing enabled him to discover where he had erred, which the obscurity of the other did not do. The agreement, however, of two writers of such established reputation as M. Euler and M. d'Alembert made him long dubious of the truth of his own solution, and induced him to revise the process again and again with the utmost circumspection; but being every time more convinced that his own solution was right and theirs wrong, he at length gave it to the public in the seventy-fifth volume of the *Philosophical Transactions* for 1785.

The extreme difficulty of the subject, joined to the concise manner in which Mr Landen had been obliged to give his solution in order to confine it within proper limits for the Transactions, rendered it too difficult, or at least too laborious a piece of business, for most mathematicians to read it; and this circumstance, joined to the established reputation of Euler, induced many to think that his solution was right and Mr Landen's wrong, an opinion which attempts were made to establish by proof. But although these attempts were manifestly abortive, as every one who perused them saw, yet they convinced Mr Landen that there was a necessity for giving his solution at greater length, in order to render it more generally understood. About this time also he met by chance with Frisi's work on cosmography, physics, and mathematics, in the second part of which there is a solution of this problem, agreeing in the result with those of Euler and D'Alembert; which is not surprising, as Frisi employed the same principle that they did. Here Mr Landen learned that Euler had revised the solution which he had formerly inserted in the Berlin Memoirs, and given it in another form and at greater length in a volume published at Gryphiswald in 1765, entitled *Theoria Motus Corporum solidorum seu rigidorum.* Having procured this book, Mr Landen found the same principles employed in it, and of course the same conclusion resulting from them, which he had observed in Euler's former solution of the problems; but as the reasoning was given at greater length, he was enabled to see more distinctly how Euler had been led into the mistake, and to set that mistake in a stronger point of view. As he had been convinced of the necessity of explaining his idea on the subject more fully, he found it necessary to lose no time in setting about it. He had for several years been severely afflicted with calculus in the bladder, and towards the latter part of his life to such a degree as to be confined to his bed for more than a month at a time; yet even this dreadful disorder did not abate his ardour for mathematical studies, the second volume of his Memoirs having been written and revised during the intervals of his disorder. This volume, besides a solution of the general problem concerning rotatory motion, contains the resolution of the problem concerning the motion of a top; an investigation of the motion of the equinoxes, in which Mr Landen first pointed out the cause of Sir Isaac Newton's mistake in his solution of this celebrated problem; and some other papers of considerable importance. He lived to see this work finished, and received a copy of it the day before his death, which happened on the 15th of January 1790, at Milton, near Peterborough, in the seventy-first year of his age.

LANDERNAU, a city of France, in the department of Finisterre, and arrondissement of Brest. It stands on the river Ellhorn, and empties itself into a bay of the road of Brest. The harbour is good. The naval hospital, and various magazines for the equipment of the marine, are built here, and fill many large storehouses. It contains 3500 inhabitants, mostly depending on the navy. Long. 4. 23. W. Lat. 48. 25. N.

LANDES, Les, or the *Heaths*, a department of France, formed out of the district of Chalosse, a part of the ancient province of Gascony. It extends over 3810 square miles, or 900,534 hectares, of which more than two thirds are barren sandy heaths. It is situated between longitude 0. 3. and 1. 39. west, and between latitude 43. 29. and 44. 39. north. It is divided into three arrondissements, twenty-eight cantons, and 368 communes, and contains 260,000 inhabitants. It is by far the most miserable part of the kingdom. It is generally a level district, covered with heath, intermixed with swamps, in which, like the oases of Africa, a few spots are to be found with inhabitants, and only near to them can a little rye be grown. The rest exhibits only heaths, or firs, or cork trees. One district in the south-east, that of Chalosse, is an exception, being moderately fertile; but it is small as compared with the whole. The chief river is the Adour, which is navigable, and receives the waters of several smaller streams. On the sea shore are several lakes. Agriculture is in a backward state; and though rye is the chief corn, yet enough is not grown for the scanty population. The climate is not healthy, the heat in summer is scorching, and in winter it is mostly cold; but snow rarely falls, and never continues throughout the whole day. The chief products are wild fowl, river and sea fish, honey, wax, timber, cork, pitch, tar, and turpentine. The wine is only good in a small part, and in others the grapes are converted into brandy. Some mines of iron are worked, but not sufficient for the demand of the department. Two deputies are elected for the house of representatives. The capital is the city of Mont de Marsan.

LANDGRAVE (formed from the German *land*, earth, and *graff*, or *grave*, judge or count), a name formerly given to those who executed justice in behalf of the emperors, with regard to the internal policy of the country. The title does not seem to have been used before the eleventh century. These judges were first appointed within a certain district of Germany; but in process of time the title became hereditary, and they assumed the sovereignty of the several districts or counties over which they presided. Landgrave is now applied by way of eminence to those sovereign princes of the empire who possess by inheritance certain estates called *landgraviates*, and of which they receive the investiture from the emperor. There are four princes who have this title, viz. those of Thuringia, Hesse, Alsace, and Leuchtenberg. There are also other landgraves, who are not princes, but counts of the empire.

LANDGRAVIATE, or LANDGRAVATE, the office, authority, jurisdiction, or territory of a landgrave.

LANDGUARD, a fort in the county of Suffolk, on the north side of the rivers Orwell and Stour, which, with other forts at Harwich, on the opposite shore, defends the entrance of those rivers.

LANDRECY, a strongly-fortified city in the department of the North, and in the arrondissement of Avesnes, in France. It is situated on a level plain on the banks of the river Sambre, which is navigable thus far. It contains 462 houses, and 3500 inhabitants, some of whom are distillers of corn spirits, and some nailsmiths. Long. 3. 33. E. Lat. 50. 4. N.

LANDSBERG, a city of Prussia, the capital of the circle of the same name, in the province of Frankfort-on-the-Oder. It is situated on the river Wartha, is well built, and surrounded with walls. It contains 836 houses, with 9200 inhabitants, amongst whom are many Jews. There are many manufacturers of woollens, stockings, and hats, some paper-mills, and several breweries and distilleries. Long. 10. 32. E. Lat. 54. 15. N.

LANDSBERG, a town of East Prussia, in the government of Königsberg and circle of Xinten, on the river Stein. It contains a Catholic and a Lutheran church, 210 houses, and 1493 inhabitants, with some makers of cloths and hosiery. Long. 20. 32. E. Lat. 54. 13. N.

LANDSBERG, a city of Bavaria, in the province of the Isar, the capital of a bailiwick of the same name. It stands on the river Lech, is surrounded with walls, and contains 502 houses, with 3350 inhabitants. Its chief employment is in working saw-mills and oil-mills, and in making turnery ware. Long. 11. 8. 11. E. Lat. 48. 2. 50. N.

LANDSCAPE, in painting, the view or prospect of a country, extended as far as the eye will reach. See PAINTING.

LANDSCAPE *Gardening*. See GARDENING.

LANDSHUT, a town of the circle of Brun, in the Austrian province of Moravia. It stands at the junction of the river Taya with the March, and contains 257 houses, with 1473 inhabitants.

LANDSHUT, a city, the capital of the circle of the same name, in the government of Reichenbach, in Prussian Silesia. It stands on the river Bober, at its junction with the Zieder. It is fortified, contains two Catholic and one Lutheran church, 496 houses, and 3658 inhabitants. It is one of the great manufacturing places for Silesia linens.

LANDSHUT, a city of the province of the Isar, situated on that river, in the kingdom of Bavaria. It is in a picturesque situation, overlooked by an ancient castle on an eminence. It contains about 600 houses, and 8200 inhabitants. It is the seat of a university, in which are from 600 to 700 pupils, and which possesses a library of 100,000 volumes, and several appropriate institutions for instruction in law, medicine, surgery, midwifery, and the sciences. The trade is inconsiderable. Near it some wine is produced. Long. 12. 4. 26. E. Lat. 48. 5. 55. N.

LANDSKRON, a town of the circle of Chrudim, in the Austrian kingdom of Bohemia. It is the seat of Prince Lichtenstein, who has a magnificent palace. It contains 671 houses, and 2671 inhabitants, who are busily employed in manufactures, and produce cotton and linen goods; of the last, especially, some of the best damask table linen. It is celebrated for the bleaching of linen goods of all kinds.

LANDSKRONA, a city of Sweden, in the province of Malmoe. It is built on the Sound, on a tongue of land, which is protected by the Graen reef of rocks. It is strongly fortified, and protected by a citadel, and contains 400 houses, with 3776 inhabitants, who carry on a brisk trade in native and foreign commodities, and are owners of some large ships. Long. 12. 45. 41. E. Lat. 55. 52. 23. N.

LANESBOROUGH, a town of Ireland, in the county of Longford, pleasantly situated on the river Shannon, over which there is here a fine bridge. It has a handsome church, and a barrack for a troop of horse. It is situated sixty-two miles north-north-west from Dublin. Long. 8. 5. W. Lat. 52. 36. N.

LANFRANCO, GIOVANNI, an eminent Italian historical painter, born at Parma in 1581. He was first the disciple of Augustin, and, after his death, of Annibal Caracci, whose taste in design and colouring he so happily attained, that he was intrusted to execute some of his designs in the Farnese Palace at Rome. By order of Pope Urban VIII. he painted in St Peter's Church at Rome the representation of that saint walking on the water, which afforded the pope so much satisfaction that he knighted him. He died in 1647.

LANFRANCO, an Italian, born at Pavia, became archbishop of Canterbury in 1070. He disputed against Berengarius in the council held at Rome in 1059, and wrote against him concerning the real presence in the eucharist. He died in 1089.

LANGBAINE, DR GERARD, a learned English writer, was born in 1608. He was educated at Queen's College, Oxford, and became keeper of the archives of that university, and provost of his college. He was highly esteemed by Usher, Selden, and other learned men; and he died in 1657. He published an edition of Longinus, in Greek and Latin, with notes; and other works.

LANGBAINE, *Gerard*, the son of the former, was born in 1656. He was put as apprentice to Mr Symonds, bookseller in St Paul's Churchyard; but was soon afterwards called thence by his mother, upon the death of his eldest brother, and by her entered as a gentleman commoner of University College, Oxford, in 1672. Here he squandered a good part of his estate; but afterwards corrected his manner of living, and for some years lived in retirement near Oxford. During this time he improved his taste for dramatic poetry; and at first wrote some small pieces without his name, but afterwards published several works which he publicly owned. In 1690 he was elected inferior beadle of arts in the university of Oxford; and, in January following, was chosen superior beadle of law; but he died in 1692. He wrote, 1. The Hunter, a Discourse on Horsemanship; 2. A new Catalogue of English Plays, with their best editions, and divers remarks on the originals of most plays, and on the plagiarisms of several authors; 3. An Account of the English Dramatic Poets.

LANGELAND, an island in the Baltic Sea, a portion of the division of Funen, separated from it by a narrow strait, over which there is a ferry. It is about thirty miles in length and four miles and three fourths in medium breadth, and extends over 106 square miles, comprising one city or town, and fourteen parishes, with 12,300 inhabitants. It is merely an agricultural spot, of moderate fertility, yielding a surplus of about 14,000 quarters of corn beyond the consumption of the population. The capital is Rudkiobing, a place of 1200 inhabitants, situated in longitude 10. 42. E. and latitude 54. 55. N.

LANGENBERG, a town of Prussian Westphalia, in the government of Minden and circle of Reckenberg, containing 321 houses, and 1956 inhabitants.

LANGENBRUCKEN, a market-town of the duchy of Baden, in Germany, in the bailiwick of Brucksal, containing 190 houses, and 1275 inhabitants.

LANGENDIELAN, a very large straggling town in the government of Reichenbach, in Prussian Silesia, which extends to the frontier of Glatz. It contains 575 houses, with 6780 inhabitants. There are nearly 1000 looms at work on cloth and plushes.

LANGENSCHWALBACH, a city of the duchy of Nassau, in Germany, the capital of the bailiwick of that name. It is celebrated for its various medicinal springs, which are much resorted to in the summer, both for health and pleasure. The vicinity presents some most picturesque scenery and beautiful promenades, and every accommodation for visitors. It contains a Lutheran, Calvinist, and Catholic church, 260 houses, and 1640 resident inhabitants.

LANGENTHAL, a large market-town of the canton of Berne, in Switzerland. It is a manufacturing place for linen and cotton, and for silk and mixed silk goods, with considerable bleaching grounds and dye-houses. It stands on the river Langentann, whose waters move machinery.

LANGESALZA, a city, the capital of a circle of the same name, in the Prussian government of Erfurt. It stands on a gentle elevation above the river Salza, is fortified, and defended by a castle, and contains four churches, four hospitals, with 940 dwelling-houses, and 6840 inhabitants. It is the most considerable manufacturing city in the Prussian part of Thuringia, making goods of silk and linen, both cloth and hosiery, and having powerful mills for spinning cotton twist. It is also a place of great commerce in corn, and the other products of the fertile soil around it. Long. 10. 33. 25. E. Lat. 51. 6. 59. N.

LANGHEMARK, a market-town of the Netherlands, in the province of West Flanders, and arrondissement of Ypres, containing 540 houses, and 4600 inhabitants.

LANGHORNE, JOHN, an English poet and miscellaneous writer, was born at Kirkby-Steven, Westmoreland, in March 1735. He received the rudiments of his education, first at Winton, and afterwards at Appleby, where he early distinguished himself by his assiduity and proficiency. He left school in his eighteenth year, and, having no means of defraying the expense of an university education, engaged himself as private tutor to a family near Ripon. His next occupation was that of assistant in the free school of Wakefield, then superintended by Mr Clarke. Whilst in this situation he took deacon's orders, and, it is said, became a popular preacher. In the year 1759, Mr Clarke recommended him as preceptor to the sons of Mr Robert Cracroft of Hackthorn, near Lincoln, who were no fewer than nine in number. During his residence at Hackthorn, he published a volume of poems, which attracted but little notice; and he also wrote some critical pieces, which were rather more fortunate. In 1760, he entered his name at Clare-Hall, Cambridge, in order to take the degree of bachelor of divinity; but as his name does not appear in the list of the Cambridge graduates, it is more than probable that he did not succeed in his object. About this time he became enamoured of one of Mr Cracroft's daughters, and having met with a refusal from the young lady, immediately left his situation. In 1761, he officiated as curate at Dagenham, where he produced a great variety of pieces, some of which he published. His Letters on Religious Retirement were dedicated to Warburton, who returned him a complimentary acknowledgment, in which he advised Langhorne to make some attempt in the cause of religion. In 1764, having obtained the curacy and lectureship of St John's, Clerkenwell, he was enabled to reside in London, the great and ready mart for literary talents. About this time he engaged with Mr Griffiths as a writer in the *Monthly Review*, in which situation he continued until about the year 1769, when his connection with the Review is supposed to have ceased, in consequence of some dispute with the editor. His employment as a critic procured him the acquaintance of many literary men, whilst the vein of ridicule, which he occasionally indulged with more freedom than discretion, made him many enemies, amongst whom were Churchill, Kelly, and Kenrick, libellers by profession. In 1765, he produced a number of pieces, besides publishing an edition of the poems of Collins, with a memoir and critical notes. He replied to Churchill's Prophecy of Famine, a libel against the Scottish nation, in a poem entitled Genius and Valour, which obtained the approbation of Dr Robertson the historian, and procured for him the degree of doctor in divinity, which was conferred on him by the university of Edinburgh. In 1767, Dr Langhorne married Miss Cracroft, the lady to whom he had so long been attached, and with whom he had never ceased to correspond. But his happiness was of short duration, as Mrs Langhorne died in childbirth, on the 4th of March 1768. Not long after his wife's death, he went to reside at Folkestone, in Kent, where his brother officiated as perpetual curate. During his residence at this place, the brothers occupied themselves in preparing a new translation of Plutarch's Lives, which appeared in 1770, and soon became a very popular book. In the year 1772, Dr Langhorne paid a visit to his native country, where he married a second wife, the daughter of a magistrate near Brough, and then set out on a tour through part of France and the Netherlands, the scenery of which afforded new themes for his industrious muse. In 1776 he lost his second wife, who, like the former, died in childbed, leaving him a daughter. In 1777, at the request of the Bouverie family, by whom he was much respected, he was presented by the bishop, Dr Moss, with a prebend in the cathedral of Wells. But his career was now approaching its close. He died on the 1st of April 1779, in the forty-fifth year of his age. In 1804, his son published an edition of his poems in two vols. 12mo, with a memoir of the author, to which we beg to refer our readers for more ample details. Dr Langhorne was a man of an amiable disposition and inoffensive manners, social in his habits, and possessed of a considerable fund of wit, which he never abused or misapplied. The leading characteristics of his poetry are ease, fluency, and a considerable share of tenderness, without much invention or originality. His prose writings are sufficiently varied to satisfy us that he was a laborious and indefatigable writer. (A.)

LANGLAND, or Longlande, Robert, an old English poet, who flourished about 1350. He was a secular priest, and a fellow of Oriel College, Oxford. He is said to have been born in Shropshire. He wrote the Visions of Pierce Plowman, a piece which abounds with imagination and humour, though dressed to great disadvantage in very uncouth versification and obsolete language. It is written without rhyme, an ornament which the poet has endeavoured to supply by making every verse begin with the same letter. Dr Hickes observes, that this kind of alliterative versification was adopted by Langland from the practice of the Saxon poets, and that these Visions abound with Saxonisms; he styles him *celeberrimus ille satirographus, morum vindex acerrimus*. Several poets attempted imitations of his visions, and the learned Selden mentions him with honour.

LANGLEY, a town and parish in the hundred of Stoke, in the county of Buckingham, eighteen miles from London. The Grand Junction Canal passes by it, and, besides the trade from that circumstance, it has some in making lace and straw-hats. Near to it are several fine seats of noblemen and gentlemen. The population amounted in 1801 to 1215, in 1811 to 1571, in 1821 to 1616, and in 1831 to 1797.

LANGPORT, a market-town of the hundred of Pitney, in the county of Somerset, 131 miles from London. It stands at the junction of the river Ivell with the Paret, which latter is navigable to the port of Bridgewater, and by which coals, iron, and other heavy goods are dispersed over a great tract of country. The market is held on Saturday. It is an ancient borough, governed by a portreeve and bailiffs; but has not returned members to parliament, as it did in ancient times. It is situated in a fertile division of the county. The population amounted in 1801 to 754, in 1811 to 861, in 1821 to 1004, and in 1831 to 1245.

LANGREL Shot, at sea, that which consists of two bars of iron joined by a chain or shackel, with half a ball of iron fixed on each end; by means of which apparatus it does great execution amongst the enemy's rigging.

LANGRES, an arrondissement of the department of the Upper Marne, in France. It extends over 926 square miles, is divided into ten cantons, and these into 209 communes, containing 92,500 inhabitants. The capital is the city of the same name near the Marne, and 1370 feet above the level of the sea. It contains 1800 houses, and 6500 inhabitants, who are chiefly employed in making cutlery and other hardwares. Long. 5. 14. 45. E. Lat. 47. 51. 59. N.

LANGTON, Stephen, was born in England, but educated at Paris, and was greatly esteemed for his learning, both by the king and the nobility of France. He was chancellor of Paris, a cardinal of Rome, and in the reign of King John was made archbishop of Canterbury by Innocent III. in opposition both to the monks of Canterbury and to the king. Langton was one of the most illustrious men of his age for learning, and continued as archbishop for twenty-two years. He died in 1228.

LANGUAGE.

I.—ORIGIN OF LANGUAGE: REMARKS ON THE IDIOM AND GENIUS OF LANGUAGE.

Origin of Language.

LANGUAGE, in the proper sense of the term, signifies the expression of our ideas and their various relations by certain articulate sounds, which are used as the signs of those ideas and relations. By articulate sounds are meant those modulations of the voice, or of sound emitted from the thorax, which are formed by means of the mouth and its several organs, the teeth, the tongue, the lips, and the palate. In a more general sense, *language* is sometimes used to denote all sounds by which animals of any kind express their particular feelings and impulses in a manner that is intelligible to their own species.

Nature has endowed every animal with powers sufficient to make known those sensations and desires with which it is necessary, for the preservation of the individual or the continuance of the kind, that others of the same species should be acquainted. For this purpose, the organs of all vocal animals are so formed as, upon any particular impulse, to utter sounds, of which those of the same species instinctively know the meaning. The summons of the hen is instantly obeyed by the whole brood of chickens; and in many others of the irrational tribes a similar mode of communication may be observed between the parents and the offspring, and also between one animal and another. But it is not amongst animals of the same species only that these instinctive sounds are mutually understood. It is as necessary for animals to know the voices of their enemies as those of their friends; and the roaring of the lion is a sound of which, previously to all experience, every beast of the forest is naturally afraid. Between these animal voices and the language of men, however, there is very little analogy. Human language is capable of expressing ideas and notions, which there is every reason to believe that the mind of the brutes cannot conceive. "Speech," says Aristotle, "is made to indicate what is expedient and what inexpedient, and, in consequence of this, what is just and unjust. It is therefore given to men, because it is peculiar to them, that of good and evil, just and unjust, they only, with respect to other animals, possess a sense or feeling." The voices of brutes seem intended by nature to express, not distinct ideas or moral modes, but only such feelings as it is for the good of the species that they should have the power of making known; and in this, as in all other respects, these voices are analogous, not to speaking, but to weeping, laughing, singing, groaning, screaming, and other natural and audible expressions of passion or appetite. Another difference between the language of men and the voices of brute animals consists in articulation, by which the former may be resolved into distinct elementary sounds or syllables; whereas the latter, being for the most part inarticulate, are not capable of such a resolution. Hence Homer and Hesiod characterize man by the epithet μεροψ, or *voice-dividing*, as denoting a power peculiar to the human species; for though there are a few birds which utter sounds that may be divided into syllables, yet each of these birds utters but one such sound, which seems to be employed rather as a note of natural music than for the purpose of giving information to others; and hence, when the bird is agitated, it utters cries which are very different, and have no articulation.

A third difference between the language of men and the significant cries of brute animals, is, that the former is the product of art, the latter derived from nature. Every human language is learned by imitation, and is intelligible only to those who either inhabit the country where it is vernacular, or have been taught it by a master or by books. But the voices in question are not learned by imitation; and being wholly instinctive, they are intelligible to all the animals of that species by which they are uttered, though brought together from the most distant countries on earth. That a dog which had never heard another bark, would notwithstanding bark himself, and that the barkings or yelps of a Lapland dog would be instinctively understood by the dogs of Spain, Calabria, or any other country, are facts which do not admit of doubt. But there is no reason to imagine that a man who had never heard any language spoken would himself speak; and it is well known that the language spoken in one country is unintelligible to the natives of another country where a different language is spoken. Indeed it seems obvious, that were there any instinctive language, the first words uttered by all children would be the same; and that every child, whether born in the desert or in society, would understand the language of every other child, however educated or however neglected. Nay, more, we may venture to affirm that such a language, though its general use might, in society, be superseded by the prevailing dialect of art, could never be wholly lost; and that no man of one country would find it difficult, far less impossible, to communicate the knowledge of his natural and most pressing wants to the men of any other country, whether barbarous or civilized. The exercise of cultivated reason, and the arts of civil life, have indeed eradicated many of our original instincts, but they have not eradicated all.

There are external indications of the internal feelings and desires, which appear in the most polished society, and which are confessedly instinctive. The passions, emotions, sensations, and appetites, are naturally expressed in the countenance by characters which the savage and the courtier can read with equal readiness. The serene look, the smoothed brow, the dimpled smile, and the glistening eye, denote equanimity and good will, in terms which no man can mistake. The contracted brow, the glaring eye, the sullen gloom, and the threatening air, denote rage, indignation, and defiance, as plainly and forcibly as revilings or imprecations. To teach men to disguise these instinctive indications of their temper, and

> To carry smiles and sunshine in their face,
> When discontent sits heavy at their heart,

constitutes a great part of modern manners. Yet in spite of every effort of the utmost skill, and of every motive resulting from interest, the most consummate hypocrite, or the most hackneyed politician, is not always able to prevent his real disposition from becoming apparent in his countenance. He may indeed, by long practice, acquire a great command over his temper, and the instinctive signs of it; but at times nature will predominate over art, and a sudden and violent passion will flash in his face, so as to be visible to the eye of every beholder. If these observations be just, and we flatter ourselves that no man will call them in question, it seems to follow, that, if mankind were prompted by instinct to use articulate sounds as indications of their passions, affections, sensations, and ideas, the language of nature could never be wholly forgotten, and that it would sometimes predominate over the language of art. Groans, sighs, and some inarticulate lively sounds, are naturally expressive of pain and pleasure, and equally intelligible to all mankind. The occasional use of these no art can wholly banish; and if there were articulate sounds, naturally expressive of the same feelings, it is not conceivable that art or education could banish the use of them, merely because by the organs of the mouth they are broken into parts and resolvable into syllables.

It being thus evident that there is no instinctive articulated language, it has become an inquiry of some importance, how mankind were first induced to fabricate articulate sounds, and to employ them for the purpose of communicating their thoughts. Children learn to speak by insensible imitation; and when advanced some years in life, they study foreign languages under proper instructors. But the first men had no speakers to imitate, and no formed language to study. By what means, then, did they learn to speak? On this question only two opinions can possibly be formed. Either language must have been originally revealed from heaven, or it must be the fruit of human invention.

The latter opinion is strongly supported by Lord Monboddo, in his very learned and able work on the Origin and Progress of Language. But he candidly acknowledges, that if language was invented, it was of very difficult invention, and far beyond the reach of the grossest savages. Accordingly he holds, that though men were originally solitary animals, and had no natural propensity to the social life; yet, before language could be invented, they must have been associated for ages, and have carried on in concert some common work. Nay, he is decidedly of opinion, that before the invention of an art so difficult as language, men must not only have herded together, but also formed some kind of civil polity, existed in that political state a very long time, and acquired such powers of abstraction as to be able to form general ideas. But it is obvious, that men could not have instituted civil polity, or carried on in concert any common work, without communicating their designs to each other; and there are four ways by which the author thinks that this might have been done before the invention of speech, viz. 1st, *Inarticulate cries*, expressive of sentiments and passions; 2d, *Gestures*, and *the expression of countenance;* 3d, *Imitative sounds*, expressive of audible things; and, 4th, *Painting*, by which visible objects may be represented.

Of these four ways of communication, it is plain that only two have any connection with language, inarticulate cries and imitative sounds; and of these the author abandons the latter as having contributed nothing to the invention of articulation, though he thinks it may have helped to advance its progress. "I am disposed," says he, "to believe, that the framing of words with an analogy to the sound of the things expressed by them belongs rather to languages of art than to the first languages spoken by rude and barbarous nations." It is therefore inarticulate cries only that must have given rise to the formation of language. Such cries are used by all animals who have any use of voice, to express their wants; and the fact is, that all barbarous nations have cries expressing different things, such as joy, grief, terror, surprise, and the like. These, together with gestures and expressions of the countenance, were undoubtedly the methods of communication first used by men. We have but to suppose, says our author, a great number of our species carrying on some common business, and conversing together by signs and cries; and we have men just in a state proper for the invention of language. For if we suppose their numbers to have increased, their wants would also increase; and then these two methods of communication would become too confined for that larger sphere of life which their wants would make necessary. The only thing, then, that remained to be done, was to give a greater variety to the instinctive cries; and as the natural progress is from what is easy to what is more difficult, the first variation would be merely by tones from low to high, and from grave to acute. But this variety could not answer all the purposes of speech in society; and being advanced so far, it was natural that an animal so sagacious as man would go on farther, and come at last to the only other variation remaining, namely, articulation. The first articulation would be very simple, the voice being broken and distinguished only by a few vowels and consonants. And as all natural cries are from the throat and larynx, with little or no operation of the organs of the mouth, it is natural to suppose, that the first languages were for the greater part spoken from the throat; that what consonants were used to vary the cries, were mostly guttural; and that the organs of the mouth would at first be very little employed. From this account of the origin of language, it appears that the first sounds articulated were the natural cries by which men signified their wants and desires to one another, such as calling one another for certain purposes, and other such things as were most necessary for carrying on any joint work; then in process of time other cries would be articulated, to signify that such and such actions had been performed or were performing, or that such and such events had happened relative to the common business. The names of such objects as they were conversant with would be invented; but as we cannot suppose savages to be deep in abstraction or skilful in the art of arranging things according to their *genera* and *species*, all things, however similar, except perhaps the individuals of the lowest species, would be expressed by different words not related to each other either by derivation or composition. Thus would language grow by degrees; and as it grew, it would be more and more broken and articulated by consonants; but still the words would retain a great deal of their original nature of animal cries. And thus things would go on, words unrelated still multiplying, till at last the language would become too cumbersome for use, and then art would be obliged to interpose, and form a language upon a few radical words, according to the rules and method of etymology.

Those who think that language was originally revealed from heaven, consider this account of its human invention as a series of mere suppositions hanging loosely together, and the whole suspended from no fixed principle. The opinions of Diodorus, Vitruvius, Horace, Lucretius, and Cicero, which are frequently quoted in its support, are in their estimation of no greater authority than the opinions of other men; for as language was formed and brought to a great degree of perfection long before the era of any historian with whom we are acquainted, the antiquity of the Greek and Roman writers, who are comparatively of yesterday, gives them no advantage in this inquiry over the philosophers of France and England. Aristotle has defined man to be a ζωον μιμητικον, or imitative animal; and the definition is certainly so far just, that man is much more remarkable for imitation than invention; therefore, say the reasoners on this side of the question, had the human race been originally *mutum et turpe pecus*, they would have continued so to the end of time, unless they had been taught to speak by some superior intelligence. That the first men sprung from the earth like vegetables, no modern philosopher has ventured to assert; nor does there anywhere appear sufficient evidence that men were originally in the state of savages. The oldest book extant contains the only rational cosmogony known to the ancient nations; and that book represents the first human inhabitants of this earth, not only as reasoning and speaking animals, but also as in a state of high perfection and happiness, of which they were deprived for disobedience to their Creator. Moses, setting aside his claim to inspiration, deserves, from the consistency of his narrative, at least as much credit as Moschus, or Democritus, or Epicurus; and from his prior antiquity, if antiquity could on this subject have any weight, he would deserve more, as having lived nearer to the period of which they all write. But the question respecting the origin of language may be decided without resting on authority of any kind, merely by considering the nature of speech, and the mental and corporeal powers of man. Those who maintain it to be of human invention, suppose men at first to have been solitary animals, afterwards to have herded together without government or subordination, then to have formed political societies, and by their own exertions to have advanced from the grossest ignorance to the refinements of science. But, say the reasoners whose cause we are now pleading, this is a supposition contrary to all history and all experience. There is not upon record a single instance well authenticated of a people emerging by their own efforts from barbarism to civilization. There have indeed been many nations raised from the state of savages; but it is known that they were polished, not by their own repeated exertions, but by the influence of individuals or colonies from nations more enlightened than themselves. The original savages of Greece were tamed by the Pelasgi, a foreign tribe; and were afterwards further polished by Orpheus, Cecrops, Cadmus, and others, who derived their knowledge from Egypt and the East. The ancient Romans, a ferocious and motley crew, received the blessings of law and religion from a succession of foreign kings; and the conquests of Rome at a later period contributed to civilize the rest of Europe. In America, the only two nations which at the invasion of the Spaniards could be said to have advanced a single step from barbarism, were indebted for their superiority over the other tribes, not to the gradual and unassisted progress of the human mind, but to the wise institutions of foreign legislators.

This is not the proper place for tracing the progress of man from the savage state to that of political society; but experience teaches us, that in every art it is much easier to improve than to invent? The human mind, when put into the proper track, is indeed capable of making great advances in arts and sciences; but if any credit be due to the records of history, it has not, in a people sunk in ignorance and barbarity, sufficient vigour to discover that track, or to conceive a state different from the present. If the rudest inhabitants of America and other countries have continued, as there is every reason to believe they have continued, for ages in the same unvaried state of barbarism; how is it imaginable that people so much ruder than they, as to be ignorant of all language, should think of inventing an art so difficult as that of speech, or even to frame a conception of the thing. In building, fishing, hunting, navigating, and the like, they might imitate the instinctive arts of other animals, but there is no other animal that expresses its sensations and affections by arbitrary articulate sounds. It is said, that before language could be invented, mankind must have existed for ages in large political societies, and have carried on in concert some common work; but if inarticulate cries, and the natural visible signs of the passions and affections, were modes of communication sufficiently accurate to keep a large society together for ages, and to direct its members in the execution of some common work, what could be their inducement to the invention of an art so useful and difficult as that of language?

Let us however suppose, say the advocates for the cause which we are now supporting, that different nations of savages set about inventing an art of communicating their thoughts, which experience had taught them was not absolutely necessary; how came they all, without exception, to think of the one art of articulating the voice for this purpose? Inarticulate cries, out of which language is fabricated, have indeed an instinctive connection with our passions and affections; but there are gestures and expressions of countenance with which our passions and affections are in the same manner connected. If the natural cries of passion could be so modified and enlarged as to be capable of communicating to the hearer every idea in the mind of the speaker, it is certain that the natural gestures could be so modified as to answer the very same purpose (see PANTOMIME); and it is strange that, among the several nations who invented languages, not one should have stumbled upon fabricating visible signs of their ideas, but that all should have agreed to denote them by articulated sounds. Every nation whose language is narrow and rude supplies its defects by a violent gesticulation; and therefore, as much less genius is exerted in the improvement of any art than was requisite for its first invention, it is natural to suppose that, had men been left to devise for themselves a method of communicating their thoughts, they would not have attempted any other than that by which they now improve the language transmitted by their fathers. It is vain to urge that articulate sounds are fitter for the purpose of communicating thought than visible gesticulation; for though this may be true, it is a truth which could hardly occur to savages, who had never experienced the fitness of either; and if, to counterbalance the superior fitness of articulation, its extreme difficulty be taken into view, it must appear little less than miraculous that every savage tribe should think of it rather than the easier method of artificial gesticulation. Savages, it is well known, are remarkable for their indolence, and for always preferring ease to utility; but their modes of life give such pliancy to their bodies, that they could with very little trouble bend their limbs and members into any positions agreed upon as the signs of ideas. This is so far from being the case with respect to the organs of articulation, that it is with extreme difficulty, if at all, that a man advanced in life can be taught to articulate any sound which he has not been accustomed to hear. No foreigner who comes to England after the age of thirty ever pronounces the language tolerably well; an Englishman of that age can hardly be taught to utter the guttural sound which a Scotchman gives to the Greek χ, or even the French sound of the vowel u; and of the solitary savages who have been caught in different forests, we know not that there has been one who, after the age of manhood, learned to articulate any language so as to make himself readily understood. The present age has indeed furnished many instances of deaf persons being taught to speak intelligibly by skilful masters moulding the organs of the mouth into the positions proper for articulating the voice; but who was to perform this task amongst the inventors of language, when all mankind were equally ignorant of the means by which articulation is effected? In a word, daily experience informs us, that men who have not learned to articulate in their childhood, never afterwards acquire the faculty of speech but by such helps as savages cannot obtain; and therefore, if speech was invented at all, it must have been either by children who were incapable of invention, or by men who were incapable of speech. A thousand, nay, a million, of children could not think of inventing a language. While the organs are pliable, there is not understanding enough to frame the conception of a language; and by the time that there is understanding, the organs are become too stiff for the task, and therefore, say the advocates for the divine origin of language, reason as well as history intimates, that mankind in all ages must have been speaking animals; the young having constantly acquired this art by imitating those who were older; and we may warrantably conclude, that our first parents received it by immediate inspiration.

To this account of the origin of language an objection readily offers itself. If the first language was communicated by inspiration, it must have been perfect, and held in reverence by those who spake it, in other words, by all mankind. But a vast variety of languages have prevailed in the world; and some of these which remain are known to be very imperfect, whilst there is reason to believe that many others are lost. If different languages were originally invented by different nations, all this would naturally follow from the mixture of these nations; but what could induce men possessed of one perfect language of divine original, to forsake it for barbarous jargons of their own invention, and in every respect inferior to that with which their forefathers or themselves had been inspired?

In answer to this objection, it is said, that nothing was given by inspiration but the faculty of speech and the elements of language; for when once men had language, it is easy to conceive how they might have modified it by their natural powers, as thousands can improve what they could not invent. The first language, if given by inspiration, must in its principles have had all the perfection of which language is susceptible; but from the nature of things it could not possibly be very copious. The words of language are either proper names or the signs of ideas and relations; but it cannot be supposed that the All-wise Instructor would load the memories of men with words to denote things then unknown, or with the signs of ideas which they had not then acquired. It was sufficient that a foundation was laid of such a nature as would support the largest superstructure which they might ever after have occasion to raise upon it, and that they were taught the method of building by composition and derivation. This would long preserve the language radically the same, though it could not prevent the introduction of different dialects in the different countries over which men spread themselves. In whatever region we suppose the human race to have been originally placed, the increase of their numbers would in process of time either disperse them into different nations, or extend the one nation to a vast distance on all sides from what we may call the seat of government. In either case they would everywhere meet with new objects, which would occasion the invention of new names; and as the difference of climate and other natural causes would compel those who removed eastward or northward to adopt modes of life in many respects different from the modes of those who travelled towards the west or the south, a vast number of words would in one country be fabricated to denote complex conceptions, which must necessarily be unintelligible to the body of the people inhabiting countries where those conceptions had never been formed. Thus would various dialects be unavoidably introduced into the original language, even whilst all mankind remained in one society and under one government. But after separate and independent societies were formed, these variations would become more numerous, and the several dialects would deviate farther and farther from each other, as well as from the idiom and genius of the parent tongue, in proportion to the distance of the tribes by whom they were spoken.

If we suppose a few people either to have been banished together from the society of their brethren, or to have wandered of their own accord to a distance, from which through trackless forests they could not return (and such emigrations have often taken place), it is easy to see how the most copious language must in their mouths have soon become narrow, and how the offspring of inspiration must have in time become so deformed as hardly to retain a feature of the ancestor whence it originally sprung. Men do not long retain a practical skill in those arts which they never exercise; and there are abundance of facts to prove, that a single man cast upon a desert island, and having to provide the necessaries of life by his own ingenuity, would soon lose the art of speaking with fluency his mother tongue. A small number of men cast away together, would indeed retain that art somewhat longer; but in a space of time not very long, it would in a great measure be lost by them or their posterity. In this state of banishment, as their time would be almost wholly occupied in hunting, fishing, and other means within their reach to support a wretched existence, they would have very little leisure, and perhaps less desire, to preserve by conversation the remembrance of that ease and those comforts of which they now found themselves for ever deprived: and they would of course soon forget all the words which in their native language had been used to denote the accommodations and elegancies of polished life. This at least seems to be certain, that they would not attempt to teach their children a part of language which in their circumstances could be of no use to them, and of which it would be impossible to make them comprehend the meaning; for where there are no ideas, the signs of ideas cannot be made intelligible. From such colonies as this, dispersed over the earth, it is probable that all those nations of savages have arisen, which have induced so many philosophers to imagine that the state of the savage was the original state of man; and if so, we see that from the language of inspiration must have unavoidably sprung a number of different dialects all extremely rude and narrow, and retaining nothing of the parent tongue, except perhaps the names of the most conspicuous objects of nature, and of those wants and enjoyments which are inseparable from humanity. The savage state has no artificial wants, and furnishes few ideas that require *terms* to express them. The habits of solitude and silence incline a savage rarely to speak; and when he speaks, he uses the same terms to denote different ideas. Speech therefore, in this rude condition of men, must be extremely narrow and extremely various. Every new region, and every new climate, suggests different ideas and creates different wants, which must be expressed either by terms entirely new, or by old terms used with a new signification. Hence must originate great diversity, even in the first elements of speech, among all savage nations, the words retained of the original language being used in various senses, and pronounced, as we may believe, with various accents.

When any of those savage tribes emerged from their barbarism, whether by their own efforts or by the aid of people more enlightened than themselves, it is obvious that the improvement and copiousness of their language would keep pace with their own progress in knowledge and in the arts of civil life; but in the infinite multitude of words which civilization and refinement add to language, it would be little less than miraculous were any two nations to agree upon the same sounds to represent the same ideas. Superior refinement, indeed, may induce imitation, conquests may impose a language, and extension of empires may melt down different nations and different dialects into one mass; but independent tribes naturally give rise to diversity of tongues, nor does it seem possible that they should retain more of the original language than the words expressive of those objects with which all men are at all times equally concerned. The variety of tongues, therefore, the copiousness of some, and the narrowness of others, furnish no good objection to the divine origin of language in general; for, whether language was at first revealed from heaven, or in a course of ages invented by men, a multitude of dialects would inevitably arise as soon as the human race had separated into a number of distinct and independent nations.[1]

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[1] In the foregoing view of this subject, the argument for the supernatural origin of language is evidently that which the author wishes to favour. But though we have, with some slight alterations, reprinted this part of the article, which was written for

Idiom and genius of language.

As the knowledge of languages constitutes a great part of erudition, as their beauties and deformities furnish employment to taste, and as these depend much upon the idioms of the different tongues, we shall proceed to make a few remarks upon the advantages and defects of some of those idioms of language with which we are best acquainted. As the words *idiom* and *genius* of a language are often confounded, it will be necessary to inform the reader, that by *idiom* we would here be understood to mean that general mode of arranging words into sentences which prevails in any particular language; and by the *genius* of a language, we mean to express the particular set of ideas which the words of any language, either from their formation or multiplicity, are most naturally apt to excite in the mind of any one who hears it properly uttered. Thus, although the English, French, Italian, and Spanish languages nearly agree in the same general *idiom*, yet the particular *genius* of each is remarkably different. The English is naturally bold, nervous, and strongly articulated; the French is weaker, and more flowing; the Italian more soothing and harmonious; and the Spanish more grave, sonorous, and stately. Now, when we examine the several languages which have been most esteemed in Europe, we find that there are only two *idioms* among them which are essentially distinguished from one another; and all those languages are divided between these two idioms, following sometimes the one and sometimes the other, either wholly or in part. The languages which may be said to adhere to the first *idiom*, are those which in their construction follow the order of nature; that is, express their ideas in the natural order in which they occur to the mind; the subject which occasions the action appearing first; then the action accompanied with its several modifications; and, last of all, the object to which it has reference. These may properly be called *analogous* languages; and of this kind are the English, French, and most of the modern languages in Europe. The languages which may be referred to the other *idiom*, are those which follow no other order in their construction than what the taste or fancy of the composer may suggest; sometimes making the object, sometimes the action, and sometimes the modification of the action, to precede or follow the other parts. The confusion which this might occasion is avoided by the particular manner of *inflecting* their words, by which they are made to refer to the others with which they ought to be connected, in whatever part of the sentence they occur, the mind being left at liberty to connect the several parts with one another after the whole sentence is concluded; and as the words may be here transposed at pleasure, those languages may be called *transpositive* languages. To this class we must, in an especial manner, refer the Latin and Greek languages. As each of these *idioms* has several advantages and defects peculiar to itself, we shall endeavour to point out the most considerable of them, in order to ascertain with greater precision the particular character and excellence of some of those languages now principally spoken or studied in Europe.

The partiality which our forefathers, at the revival of letters in Europe, naturally entertained for the Greek and Roman languages, made them look upon every distinguishing peculiarity belonging to them as *one* of the *many* causes of the amazing superiority which those languages evidently enjoyed above every other at that time spoken in Europe. This blind deference still continues to be paid to them, as our minds are early prepossessed with these ideas, and as we are taught in our earliest infancy to believe, that to entertain the least idea of our own language being equal to the Greek or Latin in any particular whatever, would be a certain mark of ignorance or want of taste. Their rights, therefore, like those of the church in former ages, remain still to be examined; and we, without exerting our reason to discover truth from falsehood, tamely sit down satisfied with the idea of their undoubted pre-eminence in every respect. But if we look around us for a moment, and observe the many excellent productions which are to be met with in almost every language of Europe, we must be satisfied that *even these* are now possessed of *some* powers which might afford at least a presumption, that if they were cultivated with a proper degree of attention, they might, in *some respects*, be made to rival, if not to excel, those beautiful and justly admired remains of antiquity. Without endeavouring to derogate from their merit, let us, with the cool eye of philosophic reasoning, endeavour to bring before the sacred tribunal of truth some of those opinions which have been most generally received upon this subject, and rest the determination of the cause on her impartial decision.

The learned reader well knows, that the several changes which take place in the arrangement of the words in every *transpositive* language, could not be admitted without occasioning great confusion, unless certain classes of words were endowed with particular variations, by means of which they might be made to refer to the other words with which they ought naturally to be connected. From this cause proceeds the necessity of several variations of *verbs*, *nouns*, and *adjectives*; which are not in the least essential or necessary in the *analogous* languages, as we have pretty fully explained under the article GRAMMAR, to which we refer for satisfaction on this head. We shall in this place consider, whether these variations are an advantage or a disadvantage to language.

As it is generally supposed that every language the verbs of which admit of *inflection*, is on that account much more perfect than one where they are varied by *auxiliaries*, we shall, in the first place, examine this with some degree of

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the earlier editions of this work, we are far from adopting the very unphilosophical opinion which it supports. We do not assert, because we could have nothing like evidence for such an assertion, that the Deity did not originally bestow on man the gift of speech; but we think, with Lord Monboddo, and many others, that if such a boon ever was conferred, it must, in the revolutions and calamities that have befallen the human race, inevitably have been lost; and therefore, that as multitudes of languages exist and have ever existed, the art of speech is one which man is capable of attaining to, independently of any supernatural aid. This is the view taken by our best philosophers. Thus, Mr Stewart, notwithstanding his well-known caution in forming conclusions on momentous subjects, unhesitatingly avows his conviction, that "the human faculties are competent to the formation of language." (*Philosophy of the Mind*, vol. iii. chap. 1.) In another place, the same admirable writer makes the following philosophical observations on this subject:—"The steps in the formation of language cannot probably be determined with certainty; yet if we can show, from the known principles of human nature, how the various parts may naturally have arisen, the mind is not only to a certain degree satisfied, but a check is given to that indolent philosophy which refers to a miracle whatever appearances, either in the natural or moral world, it is unable to explain." One of the most ingenious attempts that ever has been made to show by what steps the human mind would naturally proceed in the acquisition of speech, is that contained in Dr Adam Smith's "Considerations on the Formation of Languages." His theory may perhaps be liable to objection in some of its details; but it is developed with singular clearness and simplicity; and it must, in its general scope and design, be allowed by all candid and competent judges to be eminently philosophical. This essay was annexed by its author to the first edition of his *Theory of Moral Sentiments*; and we are told by Mr Stewart, that he always regarded it with great partiality, and that he reprinted it, without a single alteration, in the last edition of that work which he himself revised. Mr Stewart's commentary upon it (*Philosophy of the Mind*, ubi supra) ought to be perused alongst with it.

attention; and, that what is said on this head may be the more intelligible, we shall give examples from the Latin and English languages. We make choice of these languages, because the Latin is more purely *transpositive* than the Greek, and the English admits of less *inflection* than any other language that we are acquainted with.

If any preference be due to a language from the one or the other method of *conjugating* verbs, it must in a great measure be owing to one or more of these three causes: Either it must admit of a greater variety of sounds, and consequently afford more scope for harmonious diversity of tones in the language; or a greater freedom of expression is allowed in uttering any simple idea, by the one admitting of a greater variety in the arrangement of the words which are necessary to express that idea than the other does; or, lastly, a greater precision and accuracy in fixing the meaning of the person who uses the language, arise from the use of one of these forms rather than from the use of the other. For, as every other circumstance which may serve to give a diversity to language, such as the general and most prevalent sounds, the frequent repetition of any one particular letter, and a variety of other circumstances of that nature, which may serve to debase a particular language, are not influenced in the least by the different methods of varying the verbs, they cannot be here considered. We shall therefore proceed to make a comparison of the advantages or disadvantages which may accrue to a language by inflecting its verbs, with regard to variety of sound, variety of arrangement, and accuracy of meaning.

The *first* particular that we have to examine is, whether the one method of expressing the variations of a verb admits of a greater variety of sounds. In this respect the Latin seems, at first view, to have a great advantage over the English; since the words *amo*, *amabam*, *amaveram*, *amavero*, *amem*, &c. seem to be more different from one another than the English translations of these, *I love*, *I was loving*, *I had loved*, *I shall have loved*, *I may love*, &c.: for although the syllable AM is repeated in every one of the first, yet, as the last syllable usually strikes the ear with greater force, and leaves a greater impression, than the first, it is very probable that many will think the frequent repetition of the word LOVE, in the last instance, more striking to the ear than the repetition of AM in the former. We will therefore allow this its full weight, and grant that there is as great, or even a greater, difference between the sounds of the different *tenses* of a Latin verb, than there is between the words that are equivalent to them in English. But as we here consider the variety of sounds of the language in general, before any just conclusion can be drawn, we must not only compare the different parts of the same verb, but also compare the different verbs with one another in each of these languages. And here, at first view, we perceive a most striking distinction in favour of the *analogous* language over the *inflected*; for, as it would be impossible to form a particular set of inflections, different from one another, for each particular verb, all those languages which have adopted this method have been obliged to reduce their verbs into a small number of classes, all the words of each of which classes, commonly called *conjugations*, have the several variations of the *modes*, *tenses*, and *persons*, expressed exactly in the same manner, which must of necessity introduce a similarity of sounds into the language in general, much greater than where every particular verb always retains its own distinguishing sound. To be convinced of this, we need only repeat any number of verbs in Latin and English, and observe on which side the preference with respect to variety of sounds must fall.

Pono,	*I put.*	Moveo,	*I move.*
Dono,	*I give.*	Doleo,	*I ail.*
Cano,	*I sing.*	Lugeo,	*I mourn.*
Sono,	*I sound.*	Obeo,	*I die.*
Orno,	*I adorn.*	Gaudeo,	*I rejoice.*
Pugno,	*I fight.*	Incipio,	*I begin.*
Lego,	*I read.*	Facio,	*I make.*
Scribo,	*I write.*	Fodio,	*I dig.*
Puto,	*I think.*	Rideo,	*I laugh.*
Vivo,	*I live.*	Impleo,	*I fill.*
Ambulo,	*I walk.*	Abstineo,	*I forbear.*

The similarity of sounds is here so obvious in the Latin, as to be perceived at the first glance; nor can we be surprised to find it so, when we consider that all their regular verbs, amounting to four thousand or upwards, must be reduced to four conjugations, and even these differing but little from one another, which must of necessity produce the sameness of sounds which we here perceive; whereas, every language that follows the natural order, like the English, instead of this small number of uniform terminations, has almost as many distinct sounds as original verbs.

But if, instead of the present of the indicative mood, we should take almost any other tense of the Latin verb, the similarity of sounds would be still more perceptible, as many of these tenses have the same termination in all the four conjugations, particularly in the imperfect of the indicative, as below.

Pone-bam,	*I did put,*	or *was putting.*
Dona-bam,	*I did give,*	or *was giving.*
Cane-bam,	*I did sing,*	or *was singing.*
Sona-bam,	*I did sound,*	or *was sounding.*
Orna-bam,	*I did adorn,*	or *was adorning.*
Pugna-bam,	*I did fight,*	or *was fighting.*
Lege-bam,	*I did read,*	or *was reading.*
Scribe-bam,	*I did write,*	or *was writing.*
Puta-bam,	*I did think,*	or *was thinking.*
Vive-bam,	*I did live,*	or *was living.*
Ambula-bam,	*I did walk,*	or *was walking.*
Move-bam,	*I did move,*	or *was moving.*
Dole-bam,	*I did ail,*	or *was ailing.*
Luge-bam,	*I did mourn,*	or *was mourning.*
Obi-bam,	*I did die,*	or *was dying.*
Gaude-bam,	*I did rejoice,*	or *was rejoicing.*
Incipie-bam,	*I did begin,*	or *was beginning.*
Facie-bam,	*I did make,*	or *was making.*
Fodie-bam,	*I did dig,*	or *was digging.*
Ride-bam,	*I did laugh,*	or *was laughing.*
Imple-bam,	*I did fill,*	or *was filling.*
Abstine-bam,	*I did forbear,*	or *was forbearing.*

It is unnecessary to make any remarks on the Latin words in this example. But in the English translation we have carefully marked in the first column the words without any inflection; and in the second, have put down the same meaning by an inflection of our verb; which we have been enabled to do, from a peculiar excellency in our own language unknown to any other, either ancient or modern. Were it necessary to pursue this subject farther, we might observe, that the *perfect* tense in all the conjugations ends universally in I, the *pluperfect* in ERAM, and the *future* in AM or BO; in the subjunctive mood the *imperfect universally* in REM, the *perfect* in ERIM, the *pluperfect* in ISSEM, and the *future* in ERO; and as a still greater sameness is observable in the different variations for the persons in these tenses, seeing the first person plural in all tenses ends in MUS, and the second person in TIS, with little variation in the other persons, it is evident that, in respect to diversity of sounds, this method of conjugating verbs by *inflexion* is greatly inferior to the more natural method of expressing the various connections and relations of the verbal attributive by different words, usually called *auxiliaries*.

The *second* particular by which the different methods of marking the relation of the verbal attributive can affect language, arises from the variety of expressions which either of these may admit of in uttering the same sentiment. In this respect, likewise, the method of conjugation by inflection seems to be deficient. Thus the present of the indicative mood in Latin can at most be expressed only in two ways, viz. SCRIBO and EGO SCRIBO, which ought, perhaps, in strictness to be admitted only as one; whereas, in English, we can vary it in four different ways, viz. 1*st*, I WRITE; 2*dly*, I DO WRITE; 3*dly*, WRITE I DO; 4*thly*, WRITE DO I.[1] And if we consider the further variation which these receive in power as well as in sound, by having the emphasis placed on the different words, instead of four we will find eleven different variations. Thus, I *write*, with the emphasis upon the *I*; I WRITE, with the emphasis upon the word WRITE. Let any one pronounce these with the different emphases necessary, and he will be immediately satisfied that they are not only distinct from each other with respect to meaning, but also with regard to sound. The same must be understood of all the other parts of this example.

I *do write.*
I DO *write.*
I do WRITE.
WRITE *I do.*
Write I *do.*

Write I DO.
WRITE *do I.*
Write DO *I.*
Write do I.

None of the Latin tenses admit of more variations than the two above mentioned; nor do almost any of the English admit of fewer than in the above example; and several of these phrases, which must be considered as exact translations of some of the tenses of the Latin verb, admit of many more. Thus the imperfect of the subjunctive mood, which in Latin admits of the above two variations, admits in English of the following:

I might have written.
Written I might have.
Have written I might.

Written might have I.
I written might have.
Have written might I.

And if we likewise consider the variations which may be produced by a variation of the emphasis, they will be as under:

I *might have written.*
I MIGHT *have written.*
I might HAVE *written.*
I might have WRITTEN.
WRITTEN *I might have.*
Written I *might have.*
Written I MIGHT *have.*
Written I might HAVE.
HAVE *written I might.*
Have WRITTEN *I might.*
Have written I *might.*
Have written I MIGHT.

WRITTEN *might have I.*
Written MIGHT *have I.*
Written might HAVE *I.*
Written might have I.
I *written might have.*
I WRITTEN *might have.*
I written MIGHT *have.*
I written might HAVE.
HAVE *written might I.*
Have WRITTEN *might I*
Have written MIGHT *I.*
Have written might I.

In all twenty-four variations, instead of two. If we likewise consider that the Latins were obliged to employ the same word, not only to express "I *might* have written," but also, "I *could*, I *would*, or I *should* have written," each of which would admit of the same variations as the word *might*, we have in all *ninety-six* different expressions in English for the same phrase, which in Latin admits only of two, unless they have recourse to other forced turns of expression, which the defects of their verbs in this particular has compelled them to invent.

But if it should be objected that the last circumstance we have taken notice of as a defect can only be considered as a defect of the Latin language, and is not to be attributed to the inflection of their verbs, seeing they might have had a particular tense for each of these different words *might*, *could*, *would*, and *should*; we answer, that even admitting this excuse to be valid, the superiority of the analogous language as such still remains in this respect as twelve to one. Yet even this concession is greater than ought to have been made. For as the difficulty of forming a sufficient variety of words for all the different modifications which a verb may be made to undergo is too great for any rude people to overcome, we find, that every nation which has adopted this mode of inflection, not excepting the Greeks themselves, has been obliged to remain satisfied with fewer words than would have been necessary even to effect this purpose, and make the same word serve a double, treble, or even quadruple office, as in the Latin tense which gave rise to these observations. So that, however in physical necessity this may not be chargeable upon the particular mode of construction, yet in moral certainty it must always be the case; and therefore we may safely conclude, that the mode of varying verbs by inflection affords less variety in the arrangement of the words of the particular phrases, than the method of varying them by the help of auxiliaries.

But if there should still remain any shadow of doubt in the mind of the reader, whether the method of varying the verbs by *inflection* is inferior to that by *auxiliaries*, with regard to diversity of sounds or variety of expression, there cannot be the least doubt that, with respect to precision, distinctness, and accuracy in expressing any idea, the latter enjoys a superiority beyond all comparison. Thus the Latin verb *amo* may be Englished either by the words *I love* or *I do love*, and the emphasis placed upon any of the words that the circumstances may require; by means of which the meaning is pointed out with a force and energy which it is altogether impossible to produce by the use of any single word. The following line from Shakspeare's *Othello* may serve as an example:

Excellent wretch!
Perdition catch my soul, but *I* DO *love* thee.

Here the strong emphasis on the word DO gives it a force and energy which conveys, in an irresistible manner, a most perfect knowledge of the situation of the mind of the speaker at the time. That the whole energy of the expression depends upon this seemingly insignificant word, we may be at once satisfied of by keeping it away, in this manner:

Excellent wretch!
Perdition catch my soul, but *I love* thee.

How poor, how tame, how insignificant is this, when compared with the other. Here nothing remains but a tame assertion, ushered in with a pompous exclamation, which could not here be introduced with any degree of propriety. Whereas, in the way that Shakspeare has left it to us, it has an energy which nothing can surpass; for, overpowered with the irresistible force of Desdemona's charms, this strong exclamation is extorted from the soul of Othello in spite of himself. Surprised at this tender emotion, which brings to his mind all those amiable qualities for which he had so much esteemed her, and at the same time fully impressed with the firm persuasion of her guilt, he bursts out into that seemingly inconsistent exclamation, *Excellent wretch!* and then he adds in the warmth of his surprise, thinking it a thing most astonishing that any warmth of affection should still remain in his breast, he even confirms it with an oath, *Perdition catch my soul, but I* DO *love thee.* "In spite of all the falsehoods with which I know thou hast deceived me, in spite of all the crimes of which I know thee guilty, in spite of all those reasons for which I ought to hate thee, in spite of myself, still I find that I love; yes, I DO love thee." We look upon it as a thing altogether impossible to transfuse the energy of this expression into any language whose verbs are regularly inflected.

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[1] We are sufficiently aware that the last variation cannot in strictness be considered as good language, although many examples of this manner of using it in serious composition, both in poetry and prose, might easily be produced from the best authors in the English language. But, however unjustifiable it may be to use it in serious composition, yet, when judiciously employed in works of humour, this and other forced expressions of the like nature produce a fine effect, by giving a burlesque air to the language, and beautifully contrasting it with the purer diction of solid reasoning. Shakspeare has on many occasions showed how successfully these may be employed in composition, particularly in drawing the character of Ancient Pistol in Henry V. Without this liberty, Butler would have found greater difficulty in drawing the inimitable character of Hudibras. Let this apology suffice for having inserted this and other variations of the same kind, which, although they may be often improper for serious composition, have still their use in language.

In the same manner we might go through all the other tenses, and show that the same superiority is to be found in each. Thus, in the *perfect tense* of the Latins, instead of the simple AMAVI, we say I HAVE LOVED; and by the liberty we have of putting the emphasis upon any of the words which compose this phrase, we can in the most accurate manner fix the precise idea which we mean to excite; for if we say, I *have loved*, with the emphasis upon the word *I*, it at once points out the person as the principal object in that phrase, and makes us naturally look for a contrast in some other person, and the other parts of the phrase become subordinate to it: "HE *has loved* thee much, but I *have loved* thee infinitely more." The Latins, too, as they were not prohibited from joining the pronoun with their verb, were also acquainted with this excellence, which Virgil has beautifully used in this verse:

> Nos patriam fugimus;
> TU, Tityre, lentus in umbra, &c.

We are not only enabled thus to distinguish the person in as powerful a manner as the Latins, but can also with the same facility point out any of the other circumstances as principals; for if we say, with the emphasis upon the word *have*, "I HAVE *loved*," it as naturally points out the time as the principal object, and makes us to look for a contrast in that peculiarity, I HAVE: "I *have* loved indeed; my imagination *has* been led astray, my reason *has* been perverted; but, *now* that time has opened my eyes, I can smile at those imaginary distresses which once perplexed me." In the same manner we can put the emphasis upon the other word of the phrase, *loved*; "I *have* LOVED." Here the passion is exhibited as the principal circumstance; and as this can never be excited without some object, we naturally wish to know the object of that passion, "Who! what have you *loved?*" are the natural questions we would put in this case. "I have LOVED Eliza." In this manner we are, on all occasions, enabled to express, with the utmost precision, that particular idea which we would wish to excite, so as to give an energy and perspicuity to the language, which can never be attained by those languages whose verbs are conjugated by inflection; and if to this we add the inconvenience which all inflected languages are subject to, by having too small a number of tenses, so as to be compelled to make one word on many occasions supply the place of two, three, or even four, the balance is turned still more in our favour. Thus, in Latin, the same word, AMABO, stands for *shall* or *will* love, so that the reader is left to guess from the context which of the two meanings it was most likely the writer had in view. In the same manner *may* or *can* love are expressed by the same word, AMEM; as are also *might, could, would,* or *should* love, by the single word AMAREM, as we have already observed, so that the reader is left to guess which of these four meanings the writer intended to express; an ambiguity which occasions a perplexity very different from that clear precision which our language allows of, by not only pointing out the different words, but also by allowing us to put the emphasis upon any of them we please, which superadds energy and force to the precision it would have had without that assistance.

Upon the whole, therefore, after the most candid examination, we must conclude that the method of conjugating verbs by *inflection* is inferior to that which is performed by the help of *auxiliaries;* because it does not afford such a diversity of sounds, nor allow such variety in the arrangement of expression for the same thought, nor give so great distinction and precision in the meaning. It is, however, attended with one considerable advantage above the other method; for as the words of which it is formed are necessarily of great length, and more sonorous than in the analogous languages, it admits of a more flowing harmony of expression; for the number of monosyllables in this last greatly checks that pompous dignity which naturally results from longer words. Whether this single advantage is sufficient to counterbalance all the other defects with which it is attended, is left to the judgment of the reader to determine. But we may remark before we quit the subject, that even this excellence is attended with some peculiar inconveniences, which shall be more particularly pointed out in the sequel.

But perhaps it might still be objected, that although the comparisons we have made above may be fair, and the conclusion just, with regard to the Latin and English languages, yet it does not appear clear, that on that account the method of conjugating verbs by *inflection* is *inferior* to that by *auxiliaries;* for although it be allowed that the Latin language is defective in point of tenses; yet if a language were formed which had a sufficient number of inflected tenses to answer every purpose; if it had, for instance, a word properly formed for every variation of each tense; ene for *I love*, another for *I do love;* one for *I shall*, another for *I will love;* one for *I might*, another for *I could*, and *would*, and *should love;* and so on through all the other tenses; that this language would not be liable to the objections we have brought against the inflection of verbs; and that of course the objections we have brought are only valid against those languages which have followed that mode and executed it imperfectly. We answer, that although this would in some measure remedy the evil, yet it would not remove it entirely. For, in the first place, unless every verb, or every small number of verbs, were conjugated in one way, having the sound of the words in each tense, and division of tenses, as we may say, different from all the other conjugations, it would always occasion a sameness of sound, which would in some measure prevent that variety of sounds so proper for a language. And even if this could be effected, it would not give such a latitude to the expression as auxiliaries allow; for although there should be two words, one for *I might*, and another for *I could* love, yet as these are single words, they cannot be varied; whereas, by auxiliaries, either of these can be varied twenty-four different ways, as has been shown above. In the last place, no single word can ever express all that variety of meaning which we can do by the help of our auxiliaries and the emphasis. *I have loved*, if expressed by any one word, could only denote at all times one distinct meaning, so that to give it the power of ours, three distinct words at least would be necessary. However, if all this were done; that is, if there were a distinct conjugation formed for every forty or fifty verbs; if each of the tenses were properly formed, and all of them different from every other tense as well as every other verb; and these all carried through each of the different persons, so as to be all different from one another; and if likewise there were a distinct word to mark each of the separate meanings which the same tense could be made to assume by means of the emphasis; and if all this infinite variety of words could be formed in a distinct manner, different from each other, and harmonious; this language would have powers greater than any that could be formed by auxiliaries, if it were possible for the human powers to acquire such a degree of knowledge as to be able to employ it with facility. But how could this be attained, since upwards of ten thousand words would be necessary to form the variations of any one verb, and a hundred times that number would not include the knowledge of the verbs alone of such a language?[1] How much, therefore, ought we to admire the simple perspicuity of our language, which enables us, by the proper application of ten or twelve seemingly trifling words, the meaning and use of which can be attained with the utmost ease, to express all that could be expressed by this unwieldy apparatus? What can equal the simplicity or the power of the one method, but the well-known powers of the twenty-four letters, the knowledge of which can be obtained with so much ease, whilst their powers know no limits? or, what can be compared to the fancied perfection of the other, but the transcript of it which the Chinese seem to have formed in their unintelligible language?

Having thus considered pretty fully the advantages and defects of each of these two methods of varying verbs, we cannot help feeling a secret wish arise in our mind, that there had been a people sagacious enough to have united the powers of the one method with those of the other; nor can we help being surprised, that among the changes which took place in the several languages of Europe after the downfall of the Roman monarchy, some of them did not accidentally stumble on the method of doing it. From many concurring circumstances, it seems probable that the greater part, if not all, of the Gothic nations that overran Italy at that time, had their verbs varied by the help of auxiliaries; and many of the modern European languages which have sprung from them, have so far borrowed from the Latin, as to have some of the tenses of their verbs inflected. Yet the English alone have in any instance combined the joint powers of the two, which could only be done by forming inflections for the different tenses in the same manner as the Latins, and at the same time retaining the original method of varying them by auxiliaries; by which means either the one or the other method could have been employed as occasion required. We have luckily two tenses formed in that way, the *present* of the indicative, and the aorist of the *past*. In almost all our verbs these can be declined either with or without auxiliaries. Thus the present, without an auxiliary, is, *I love, I write, I speak;* with an auxiliary, *I do write, I do love, I do speak.* In the same manner, the past tense, by inflection, is, *I loved, I wrote, I spoke;* by auxiliaries, *I did love, I did speak, I did write.* Every author who knows any thing of the power of the English language, knows the use which may be made of this distinction. What a pity is it that we should have stopt short so soon. How blind was it in many other nations to imitate the defects without making a proper use of that beautiful language which is now numbered among the dead.

After the verbs, the next most considerable variation we find between the *analogous* and *transpositive* languages is in the nouns; the latter varying the different cases of these by *inflection;* whereas the former express all the different variations of them by the help of other words prefixed, called *prepositions.* Now, if we consider the advantages or disadvantages of either of these methods under the same heads as we have done the verbs, we shall find, that with regard to the first particular, viz. variety of sounds, almost the same remarks may be made as upon the verbs; for if we compare any particular noun by itself, the variety of sound appears much greater between the different cases in the *transpositive,* than between the translation of these in the *analogous* language. Thus REX, REGIS, REGI, REGEM, &c. are more distinct from one another in point of sound, than the translation of these, *a king, of a king, to a king, a king,* &c. But if we proceed one step further, and consider the variety which is produced in the language in general by the one or the other of these methods, the case is entirely reversed. For as it would have been impossible to form distinct variations, different from one another, for each case of every noun, they have been obliged to reduce all their nouns into a few general classes, called *declensions,* and to give to all those included under each class the same termination in every case, which produces a like similarity of sound with what we already observed was occasioned to the verbs from the same cause; whereas, in the analogous languages, as there is no necessity for any constraint, there is almost as great a variety of sounds as there are of nouns. The Latins have only five different declensions; so that all the great number of words of this general order must be reduced to the very small diversity of sounds which these few classes admit of; and even the sounds of these few classes are not so much diversified as they might have been, as many of the different cases in the different declensions have exactly the same sounds, as we shall have occasion to remark more fully hereafter. We might here produce examples to show the great similarity of sounds between different nouns in the Latin language, and variety in the English, in the same way as we did of the verbs; but as every reader in the least acquainted with these two languages can satisfy himself in this particular, without any further trouble than by marking down any number of Latin nouns, with their translations into English, we think it unnecessary to dwell longer on this particular.

But if the inflection of nouns is a disadvantage to a language in point of diversity of sounds, it is very much the reverse with regard to the variety it allows in the arranging the words of the phrase. Here, indeed, the transpositive language shines forth in all its glory, and the analogous must yield the palm without the smallest dispute. For as the *nominative case,* or that noun which is the cause of the energy expressed by the verb, is different from the *accusative,* or that noun upon which the energy expressed by the verb is exerted, these may be placed in any situation that the writer shall think proper, without occasioning the smallest confusion; whereas in the analogous languages, as these two different states of the noun are expressed by the same word, they cannot be distinguished

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[1] This assertion may perhaps appear to many very much exaggerated; but if any one should think so, we only beg the favour that he will set himself to mark all the variations of tenses, mode, person, and number, which an English verb can be made to assume, varying each of these in every way that it will admit, both as to the diversity of expression and the emphasis, and he will soon be convinced that we have here said nothing more than enough.

but by their position alone; so that the noun which is the efficient cause must always precede the verb, and that which is the passive subject must follow, which greatly cramps the harmonious flow of composition. Thus the Latins, without the smallest perplexity in the meaning, could say either *Brutum amavit Cassius*, or *Cassius amavit Brutum*, or *Brutum Cassius amavit*, or *Cassius Brutum amavit.* As the termination of the word *Cassius* always points out that it is in the *nominative case*, and therefore that he is the person from whom the energy proceeds; and in the same manner, as the termination of the word *Brutum* points out that it is in the *accusative case*, and consequently that he is the object upon whom the energy is exerted; the meaning continues still distinct and clear, notwithstanding of all these several variations; whereas, in the English language, we could only say, *Cassius loved Brutus*, or, by a more forced phraseology, *Cassius Brutus loved.* Were we to reverse the case, as in the Latin, the meaning also would be reversed; for if we say *Brutus loved Cassius*, it is evident, that instead of being the person beloved, as before, *Brutus* now becomes the person from whom the energy proceeds, and *Cassius* becomes the object beloved. In this respect, therefore, the analogous languages are greatly inferior to the transpositive; and, indeed, it is from this single circumstance alone that they derive their chief excellence.

But although it thus appears evident that any language which has a particular variation of its nouns to distinguish the *accusative* from the *nominative case*, has an advantage over those languages which have none; yet it does not appear that any other of their *cases* adds to the variety, but rather the reverse; for in Latin we can only say *Amor Dei;* in English the same phrase may be rendered either *the love of God, of God the love*, or, by a more forced arrangement, *God the love of.* And as these oblique cases, as the Latins called them, except the accusative, are clearly distinguished from one another and from the nominative by the preposition which accompanies them, we are not confined to any particular arrangement with regard to these, as with the accusative, but may place them in what order we please, as in Milton's elegant invocation at the beginning of Paradise Lost.

> Of man's first disobedience, and the fruit
> Of that forbidden tree, whose mortal taste
> Brought death into the world, and all our wo,
> With loss of Eden, till one greater man
> Restore us, and regain the blissful seat,
> Sing, heavenly muse.

In this sentence the transposition is almost as great as the Latin language would admit of, and the meaning as distinct as if Milton had begun with the plain language of prose.

Before we leave this head, we may remark, that the little attention which seems to have been paid to this peculiar advantage derived from the use of an accusative case different from the nominative, is somewhat surprising. The Latins, who had more occasion to attend to this with care than any other nation, and even the Greeks themselves, have in many cases overlooked it, as is evident from the various instances we meet with in their languages where this is not distinguished. For all nouns of the neuter gender, both in Greek and Latin, have in every declension their nominative and accusative singular alike. Nor in the plural of such nouns is there any distinction between these two cases; and in Latin all nouns whatever of the third, fourth, and fifth declensions, of which the number is very considerable, have their nominative and accusative plural alike. So that their language reaps no advantage in this respect from almost one half of their nouns. Nor have any of the modern languages in Europe, however much they may have borrowed from the ancient languages in other respects, attempted to copy from them in this particular; from which perhaps more advantage would have been gained than from copying all the other supposed excellencies of their language. But to return to our object.

It remains that we consider whether the inflection of nouns gives any advantage over the method of defining them by prepositions, in point of distinctness and precision of meaning? But in this respect, too, the analogous languages must come off victorious. Indeed, this is the particular in which their greatest excellence consists; nor was it, we believe, ever disputed but that, in point of accuracy and precision, this method must excel all others, however it may be defective in other respects. We observed under this head, when speaking of verbs, that it might perhaps be possible to form a language by inflection which should be capable of as great accuracy as in the more simple order of auxiliaries; but this would have been such an infinite labour that it was not to be expected that ever human powers would have been able to accomplish it. More easy would it have been to have formed the several inflections of the nouns so different from one another as to have rendered it impossible ever to mistake the meaning. Yet even this has not been attempted. And as we find that those languages which have adopted the method of inflecting their verbs are more imperfect in point of precision than the other, so the same may be said of inflecting the nouns; for, not to mention the energy which the analogous languages acquire by putting the accent upon the noun, or its preposition, when in an oblique case, according as the subject may require, to express which variation of meaning no particular variety of words have been invented in any inflected language, they are not even complete in other respects. The Latin, in particular, is in many cases defective, the same termination being employed in many instances for different cases of the same noun. Thus the genitive and dative singular, and nominative and vocative plural, of the first declension, are all exactly alike, and can only be distinguished from one another by the formation of the sentence; as are also the nominative, vocative, and ablative singular, and the dative and ablative plural. In the second, the genitive singular and nominative and vocative plural are the same, as are also the dative and ablative singular, and dative and ablative plural, except those in UM, whose nominative, accusative, and vocative singular, and nominative, accusative, and vocative plural, are alike. The other three declensions agree in as many of their cases as these do, which evidently tends to perplex the meaning, unless the hearer is particularly attentive to and well acquainted with the particular construction of the other parts of the sentence; all of which is totally removed, and the clearest certainty exhibited at once, by the help of prepositions in the analogous languages.

It will hardly be necessary to enter into such a minute examination of the advantages or disadvantages attending the variation of *adjectives;* as it will appear evident, from what has been already said, that the endowing them with terminations similar to, and corresponding with, *substantives*, must tend still more to increase the similarity of sounds in any language, than any of those particulars we have already taken notice of; and were it not for the liberty which they have, in transpositive languages, of separating the adjective from the substantive, this must have occasioned such a jingle of similar sounds as could not fail to have been most disgusting to the ear: but as it would have been impossible in many cases, in those languages where the verbs and nouns are inflected, to have pronounced the words which ought to have followed each other, unless their adjectives could have been separated from the substantives; therefore, to remedy this inconvenience, they were forced to devise this unnatural method of inflecting them also; by which means it is easy to recognise to what substantive any adjective has a reference, in whatever part of the sentence it may be placed. In these languages, therefore, this inflection, both as to gender, number, and case, becomes absolutely necessary; and, by the diversity which it admitted in the arranging the words of the several phrases, might counterbalance the jingle of similar sounds which it introduced into the language.

Having thus examined the most striking particulars in which the transpositive and analogous languages differ, and endeavoured to show the general tendency of every one of the particulars separately, it would not be fair to dismiss the subject without considering each of these as a whole, and pointing out their general tendency in that light: for we all know, that it often happens in human inventions, that every part which composes a whole, taken separately, may appear extremely fine; and yet, when all these parts are put together, they may not agree, but produce a jarring and confusion very different from what we might have expected. We therefore imagine a few remarks upon the genius of each of these two distinct *idioms* of language, considered as a whole, will not be deemed useless.

Although all languages agree in this respect, that they are the means of conveying the ideas of one man to another; yet as there is an infinite variety of ways in which we might wish to convey these ideas, sometimes by the easy and familiar mode of conversation, and at other times by more solemn addresses to the understanding, by pompous declamation, &c. it may so happen, that the genius of one language may be more properly adapted to the one of these than the other, while another language may excel in the opposite particular. This is exactly the case in the two general *idioms* of which we now treat. Every particular in a transpositive language is peculiarly calculated for that solemn dignity which is necessary for pompous orations. Long-sounding words, formed by the inflection of the different parts of speech; flowing periods, in which the attention is kept awake by the harmony of the sounds, and in expectation of that word which is to unravel the whole; if composed by a skilful artist, are admirably suited to that solemn dignity and awful grace which constitute the essence of a public harangue. On the contrary, in private conversation, where the mind wishes to unbend itself with ease, these become so many clogs which encumber and perplex. At these moments we wish to transfuse our thoughts with ease and facility, we are tired with every unnecessary syllable, and wish to be freed from the trouble of attention as much as may be. Like our state robes, we would wish to lay aside our pompous language, and enjoy ourselves at home with freedom and ease. Here the solemnity and windings of the *transpositive* language are burdensome; while the facility with which a sentiment can be expressed in the *analogous* language is the thing that we wish to acquire. Accordingly, in Terence and Plautus, where the beauties of dialogue are most charmingly displayed, transposition is sparingly used. In this humble, though most engaging sphere, the analogous language moves unrivalled; in this it wishes to indulge, and never tires. But it in vain attempts to rival the *transpositive* in dignity and pomp: the number of monosyllables interrupts the flow of harmony; and although they may give a greater variety of sounds, yet they do not naturally possess that dignified gravity which suits the other language. This, then, must be considered as the striking particular in the genius of these two different *idioms*, which marks their characters.

If we consider the effects which these two different characters of language must naturally produce upon the people who employ them, we will soon perceive, that the genius of the *analogous* language is much more favourable for the most engaging purposes of life, the civilizing the human mind by mutual intercourse of thought, *than the transpositive.* For as it is chiefly by the use of speech that man is raised above the brute creation; as it is by this means he improves every faculty of his mind, and, to the observations which he may himself have made, has the additional advantage of the experience of those with whom he may converse, as well as the knowledge which the human race have acquired by the accumulated experience of all preceding ages; as it is by the enlivening glow of conversation that kindred souls catch fire from one another, that thought produces thought, and each improves upon the other, till they soar beyond the bounds which human reason, if left alone, could ever have aspired to; we must surely consider that language as the most beneficial to society which most effectually removes those bars that obstruct its progress. Now, the genius of the *analogous* languages is so easy, so simple and plain, as to be within the reach of every one who is born in the kingdom where it is used to speak it with facility; even the rudest among the vulgar can hardly fall into any considerable grammatical errors: whereas, in the *transpositive* languages, so many rules are necessary to be attended to, and so much variation is produced in the meaning, by the slightest variations in the sound, that it requires a study far above the reach of the illiterate mechanic ever to attain. So that, how perfect soever the language may be when spoken with purity, the bulk of the nation must ever labour under the inconvenience of rudeness and inaccuracy of speech, and all the evils which this naturally produces. Accordingly, we find, that in Rome, a man, even in the highest rank, received as much honour, and was as much distinguished among his equals, for being able to converse with ease, as a modern author would be for writing in an easy and elegant style; and Cæsar among his contemporaries was as much esteemed for his superiority in speaking the language in ordinary conversation with ease and elegance, as for his powers of oratory, his skill in arms, or his excellence in literary composition. It is needless to point out the many inconveniences which this must unavoidably produce in a state. It is sufficient to observe, that it naturally tends to introduce a vast distinction between the orders of men; to set an impenetrable barrier between those born in a high and those born in a low station; to keep the latter in ignorance and barbarity, while it elevates the former to such a height as must subject the other to be easily led by every popular demagogue. How far the history of the nations who have followed this *idiom* of language confirms this observation, every one is left to judge for himself.

II. AFFINITIES OF LANGUAGES.[1]

The study of the affinities of various languages is so far one of the most important of all branches of human knowledge, as it affords, when properly applied, an unerring test of the truth or falsehood of historical evidence, without which it would sometimes be impossible to unravel the mysteries of contradictory testimonies, respecting the relations of the different races of mankind. We have, for example, no traditional evidence in support of any connection between the ancient Egyptians and the Indians; whilst, on the other hand, a number of persons, who came with the English army from the East Indies into Egypt, were so strongly impressed with the resemblance of the

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[1] This part of the article was written by the late Dr Thomas Young, for the *Supplement* to the former editions of this work.

Egyptian and Indian temples, which appeared even to excite the religious feelings of many of the natives who were amongst the troops employed, that a very general inclination has arisen from these circumstances, to consider the Egyptian mythology as merely a branch of the Indian. But if the Egyptian people had really been of Indian origin; that is, if the Egyptians and Indians had really been one people, at any later period than that at which the whole of the Indian and European races were separated from their common stock; the languages of India and of Egypt could not but have exhibited some features of resemblance, which would have preserved the traces of the connection; whilst, in fact, there is much less similarity between the Egyptian and the Indian, than between the Indian and the Greek, or the English and the Persian; so that etymology may here be adduced as confirming the evidence, or as justifying the silence, of history; and the resemblance of the mythological representations must be considered as in great measure accidental.

It is, however, only with regard to the languages of the ancient world that we can feel much interest in such an investigation. The American dialects might afford equally extensive subjects of speculation in a metaphysical and critical point of view; but the concerns of barbarians, unconnected and remote from all contact with literature or civilization, and destitute of all historical records, will scarcely be thought to require any great portion of attention from a philosophical inquirer; and there is ample scope for the employment of all our faculties in the analysis and comparison of the various languages of Europe, Asia, and Africa. If, indeed, an extraordinary exertion of enterprise and industry, which can be expected from a few distinguished individuals only in the course of as many centuries, should make known relations, such as Alexander von Humboldt has appeared to discover, between the American and Asiatic nations, a new field would be opened for the gratification of our curiosity; but it can scarcely be expected that these points of resemblance can be sufficiently numerous to afford any thing like demonstrative evidence, until the whole subject has been much more deeply and repeatedly discussed. In the mean time, a very brief enumeration of the names of the American languages is all that can be required, on an occasion like the present; except the insulated though interesting remark, that the countries separated by Behring's Straits exhibit, as might indeed be expected, strong resemblances in some of their languages.

Of language in general we do not here intend to treat, but merely of languages as they are distinct from each other. It is not, however, very easy to say what the definition ought to be that should constitute a separate language; but it seems most natural to call those languages distinct, of which the one cannot be understood by common persons in the habit of speaking the other, so that an interpreter would be required for communication between persons of the respective nations. Still, however, it may remain doubtful whether the Danes and the Swedes could not, in general, understand each other tolerably well, and whether the Scottish Highlanders and the Irish would be able to drink their whisky together without an interpreter; nor is it possible to say, if the twenty ways of pronouncing the sounds belonging to the Chinese characters, ought or ought not to be considered as so many languages or dialects, though they would render all oral intercourse between the persons so speaking the language actually impracticable. But, whether we call such variations different languages, or different dialects, or merely different pronunciations of the same dialect, it is obvious that they ought all to be noticed in a complete history of languages; and, at the same time, that the languages so nearly allied must stand next to each other in a symmetrical order; the perfection of which would be, to place the nearest together those languages in which the number of coincidences in the signification of words throughout the language are the most numerous.

It has sometimes been imagined, that all languages in existence present something like a trace of having been deduced from a common origin; and it would be difficult to confute this opinion by very positive evidence, unless every separate language had been very completely analysed and examined by a person well acquainted with a variety of other languages, with which it might be compared. But, without such an examination, the opinion must remain conjectural only, and no more admissible as demonstrated, than the opinions of some empirics, that there is only one disease, and that the only remedy for it is brandy. In an essay on probabilities, lately published in the *Philosophical Transactions*, Dr Young has remarked, that "nothing whatever could be inferred, with respect to the relation of two languages, from the coincidence of the sense of any single word in both of them," that is, supposing the same simple and limited combinations of sounds to occur in both, but to be applied accidentally to the same number of objects, without any common links of connection; "and that the odds would only be three to one against the agreement of two words, but if three words appeared to be identical, it would be more than ten to one that they must be derived, in both cases, from some parent language, or introduced in some other manner," from a common source; whilst "six words would give near 1700 chances to one, and eight near 100,000; so that, in these last cases, the evidence would be little short of absolute certainty."

The author of the article in the *Quarterly Review*, on Adelung's *Mithridates* observes, that, setting out from the establishment of a certain number of separate languages as species, "we may proceed to comprehend, in the description of one *family*, such as have more coincidences with each other than diversities, and to refer to the same *class* such families as exhibit any coincidences at all that are not fortuitous, imitative," that is, from onomatopœia, "or adoptive. In order, however, to avoid too great a number of classes, which would arise from an inadequate comparison of languages imperfectly known, it may be proper, in some cases, to adopt a geographical distinction, as sufficient to define the limits of a class, or to assist in its subdivision into orders. We are thus obliged to employ an arrangement of a mixed nature;" and, in fact, the tests of affinity here proposed depend so much on the progress of our knowledge in the study of each language, that the results must unavoidably be liable to great uncertainty and fluctuation, so that we can reasonably expect nothing more than an approximation to an arrangement completely methodical.

"If," continues the reviewer, "the resemblance or identity of a single word, in two languages, supposed to be exempt from the effects of all later intercourse, were to be esteemed a sufficient proof of their having been derived from a common stock, it would follow, that more than half the languages of the universe would exhibit traces of such connection, in whatever order we might pursue the comparison. Thus we find in a very great number, and perhaps in a majority of known languages, that the sound of the vowel *a*, with a labial consonant, is employed for the name of *Father*; and if this be supposed to be something like an onomatopœia, or an application of the first sounds which an infant naturally utters, the same reason cannot possibly be assigned for the still more general occurrence of the combination NM in the term *name*, which is by no means likely to have originated from any natural association of this kind. But neither these points of resemblance, nor any other that can be assigned, are absolutely universal; for, besides the numberless varieties referrible more or less immediately to *Abba, Father*, we have at least twenty different and independent terms for the same relation in the old world;" *Tia, Issa, Plar, Hair, Rama, Diam, Bina, Kettem, Assainalagi, Medua, Thewes, Sünk, Iot, Anathien, Messee, Indaa, Nu, Nam, Monung, Dengabey, Ray, Tikkob*, and *Oa;* and about as many for *Name*, besides those languages in which the version of an abstract term of this kind is less likely to have been ascertained; *Ming, Tren, Diant, Sheu, Hessara, Shem, Tsarship, Ad, Nipta, Lüm, Sacheli, Assia, Wasta, Ngala, Taira, Sünna, Ran, Hhili, Ding, Dbai*, and *Anghara.* "At the same time, therefore, that we venerate the traces of our common descent from a single pair, wherever they are still perceptible, we must not expect to find them in all existing languages without exception; and an *Etymologicon Universale*, considered as intended to establish such a perfect community of derivation, can only be regarded as a visionary undertaking. Nor must we neglect to unite, in some common arrangement of classification, those languages which have the words here specified, or any other radical words, in common, as incomparably more related to each other than the Chinese to the Cantabrian, or the Irish to the Hottentot.

"The gradations, by which a language is likely to vary in a given time, seem to be in some measure dependent on the degree of cultivation of the language, and of the civilization of the people employing it. From Homer to the Byzantine historians, the Greek language remained essentially the same for 2000 years; the German has varied but little in 1500; and even the English, notwithstanding its mixture with French and Latin, has altered but three radical words out of the fifty-four which constitute the Lord's Prayer, in the same period. On the other hand, a few barbarians in the neighbourhood of Mount Caucasus and of the Caspian Sea, of modern origin, and ignorant of the art of writing, are divided into more nations speaking peculiar languages, radically different from each other, than the whole of civilized Europe. In such cases, little light can be thrown upon history by etymological researches, while, with regard to more cultivated nations, we obtain, from the examination of their languages, historical evidence of such a nature, as it is scarcely possible for either accident or design to have falsified."

According to the supposition of Professor Adelung, it seems not improbable that Thibet, on the east of Cashmere, may "have been the habitation of Adam immediately after his fall, and the country occupied by the descendants of Cain. In Thibet, and in the countries immediately beyond it, the languages of at least a hundred and fifty millions of people are still principally *monosyllabic;* and from this peculiarity, as well as from the singular simplicity of their structure, they are supposed to constitute the most ancient class of existing languages, though it must be confessed that much of Adelung's reasoning on this subject is extremely inconclusive." Mr Townsend remarks very judiciously, that one of the canons of Rudbeck is by no means admissible. "He states, that a language, which has numerous monosyllabic expressions, is a parent language. The English has more than 3700 monosyllabic expressions, and the Chinese has none but such; yet neither of them is, for that reason, to be considered as a parent language. Certain it is, that all languages, by abbreviations, have a tendency to become monosyllabic, and therefore a language which abounds in monosyllables is ancient, and these commonly are the most antiquated parts of every language. New compounds are incessantly created. These are abbreviated, and in process of time become monosyllabic. In deriving, therefore, a word in one language, from its correspondent expression in some other language, we must ever bear in mind, that, unless in the formation of new compounds, the least abbreviated is commonly the parent, and the most abbreviated its offspring. Would it be possible for any one to persuade us that *Colaphus* was derived from *Cuff*, or *Blaspheme* from *Blame?* "A similar instance," says the reviewer, "might be found in *Trachelos* and *Hals* of the Greeks and Germans; for certainly *Hals* is more like *Trachelos* than like *Collum.*

The Chinese, however, which is the principal, and probably the most ancient, of the monosyllabic languages, is distinguished from almost all others by a more marked peculiarity, which is, that its written characters, instead of depicting sounds, are the immediate symbols of the objects or ideas, and are even imperfectly represented by the sounds, whatever difference of accent or tone may be exhibited by the most refined speaker; as indeed it may happen accidentally in our own language, that we may be at a loss to explain, without circumlocution, whether we mean to say *Son* or *Sun; Beer* or *Bier; Bear* or *Bare; You, Ewe, Yew*, or *U;* but in the Chinese the real cause of this essential characteristic appears to be, that the symbol was in fact originally intended as a hieroglyphic or picture of the object, though the resemblance, coarse as it probably was at first, has been generally altogether lost by the modifications which the character has conventually undergone. And in this point of view the Chinese would require to be classed with the old Egyptian only, since we know of no other language which was habitually expressed in hieroglyphics and their immediate derivatives. It is not at all uncommon for the same sound in Coptic, as in Chinese, to have four or five senses all essentially different, as may easily be observed in turning over a dictionary; HOOU, for instance, means *Bad*, and *Them*, and a *Shower*, in two verses of St Matthew (v. 45, 46), and perhaps several other things.

Another ancient and extensive class of languages, united by a greater number of resemblances than can well be altogether accidental, may be denominated the *Indo-European*, comprehending the Indian, the West Asiatic, and almost all the European languages. If we chose to assign a geographical situation to the common parent of this class, we should place it to the south and west of the supposed origin of the human race; leaving the north for our third class, which we can only define as including all the Asiatic and European languages not belonging to the two former; which may be called Atactic, or, perhaps, without much impropriety, TATARIC; and which may be subdivided into five orders, *Sporadic, Caucasian, Tartarian, Siberian*, and *Insular.* The *African* and *American* languages will constitute a fourth and fifth class, sufficiently distinct from all the rest, but not intended to be considered as any otherwise united among themselves, than by their geographical situation. There is indeed little doubt, that some of the languages here called Tataric are essentially allied to others, which are referred to the Indo-European class; but they have been too little investigated to allow us to make the selection that would be required for completing the classification.

The following tables are copied, with considerable additions, from Adelung's *Mithridates.* The words *Heaven* and *Earth* are chosen as specimens, because they seem to be known in a greater number of languages than any others, except the name of *Father*, which is supposed to exhibit, in some cases, a fallacious similarity. The German orthography has been principally employed, except in such languages as are usually written in the Roman characters, the pronunciation of the consonants being more uniform than in English, and that of the vowels differing little from the Italian.

CLASSES, *Orders*, and Families of LANGUAGES.

I. MONOSYLLABIC.
1. Chinese
2. Siamese
3. Avanese
4. Tibetan.

II. INDO-EUROPEAN.
5. Sanscrit
6. Median
7. Arabian
8. Lycian
9. Phrygian
10. Greek
11. German
12. Celtic
13. Etruscan
14. Latin
15. Cantabrian
16. Sclavic

III. TATARIC.
i *Sporadic*
17. Tshudish
18. Hungarian
19. Albanian
ii. *Caucasian*
20. Armenian
21. Georgian
22. Abassan
23. Circassian
24. Ossetish
25. Kistic
26. Lesgian
iii. *Tartarian*
27. Turco-Tartarian
28. Mantshuric
29. Tungusic
iv *Siberian*
30. Permian
31. Wogulic
32. Ostiak
33. Tsheremissic
34. Morduin
35. Teptjerai
36. Samoiedic
37. Camashic
38. Jeniseiostiak
39. Jukadshiric
40. Koriak
41. Kamtshatkan
v. *Insular*
42. Kurilee
43. Eastern Islands
44. Japanese
45. Leu Cheu
46. Formosan
47. Philippine
48. New Holland, E.
49. Van Diemen's
50. New Caledonian
51. New Zealand
52. Easter Island

IV. AFRICAN.

V. AMERICAN.

FAMILIES, Species, or Distinct Languages, and *Varieties* or *Dialects*, with Specimens.

I. MONOSYLLABIC CLASS.

	Heaven, Sky.	Earth.
1. CHINESE	Tien, Li	Ti, To
Fo Kien	Tshio	Tshiö
Tonquinese	Thien, Bloi	Dat, Diä
Laos	(*Man*, Phu chai)	
2. SIAMESE	Sa wang (*Man*, Pho chai, *Hand*, Mu)	Din
3. AVANESE	Mo kaun, Nip ban	Lu pu, Mié
Peguan	Mo kaun	La pri ? Tre
Rukheng	(*Man*, Lu ; *Hand*, Lak)	
4. TIBETAN	Nam khei	Dshik ten, Sa

II. INDO-EUROPEAN CLASS.

	Heaven, Sky.	Earth.
5. SANSKRIT	Paramandale, Vana, Aagaska, Svarga, Veigunda, Arthaloga, Nibu (*Man*, Purusha)	Bumi, Stira
Prakrit	Saggó (*Man*, Pariso)	
Bali	Saggó (*Man*, Burutsa)	
Devanagri	Ardwa, Arthaloga	Buma
Nepal		
Assam		
Tiperah		
Kassai		
Bengalee	Shorgue, Behesht	Porthibit Morto
Hindee		
Urdu		
Brijbassa		
Jypura		
Hindustanee		
Moors	Asmaan, Mukuti	Sjimien, Dshiamin, Dunia
Udiapura		
Benares	Ashaman	Terti
Munipura		
Goandee		
Orissa		
Telug	Paramandal	Bumi, Bumilo
Telinga	(*King*, Raja)	Naela
Carnatic		
Marwa		
Tamul	Wana, Mana, Paramandal	Pumii, Nawarg
Maleiam	Wana (*Bread*, Appam)	
Malabar	Asmanu, Agasha	Bhumi, Samina
Kanara	Weikuntha, Agasha	Pumandala, Puma
Decan	Sorgi	Pirtumir, Soumssar, Zimmin
Kunkuna		
Mahratta	Weikuntham, Suargi, Agasha	Pumandi, Saumsar, Puma
Guzurat	Paramanda	Bumi
Beloshee		
(Afghan)		
Bikanira		
Sindh		
Multan	Oshman	Dzhemi
Gipsey	Amengi, Tsheros	Pu, Phu, Pube
Wuch		
Sikh		
Cashmir		
Kuch	(1. Katka ; 3. Tuhmka ; *Man*, Mipa ; *Father*, P'ha)	
Maldivian	Ouddou, Uda	Bin
Cingalese	Swärga, Ahaza	Bumidshe, Bumi
Malayan	Surga	Bumi, Dunga, Tana
Sumatran		
Batta	(*Day*, Torangharik)	Tana
Rejang	(*Day*, Bileytueng)	Pihta
Lampuhn	(*Day*, Rannih)	Tanno
Achim	(*Day*, Urai)	Tano
Néas		
Poggy		
Javanese	Surga, Dilangin	Lemmá, Darat
Borneo	(*Night*, Malang)	
Andaman	Madamo (*Head*, Tabai)	Totongnandshi
6. MEDIAN		
Zendish	Tshekhre, Sakhter, Esmené, Sperezé	Za, Zao, Zemo, Zemeno
Pehlvish	Tsherk, Shmeha, Seper	Zivanand, Arta, Damik, Leka, Bamih
Persian	Asmon	Semin, Zemin, Chaki, Chark, Bum
(*Bucharian*)		
Kurdish	Asman, Bauta	Ard, Sigit, Chaak, Choli
Afghan	Asmo, Asman	Smak, Sm'ige, Zmuku

	Heaven, Sky.	Earth.
7. ARABIAN		
Syriac	Shemaio	Aro, Areto
Assyrian	Simmi	Dinii
Phenician		
Punic		
Hebrew	Shamaiim	Arez
Chaldee	Shemaia	Ara, Arga
Samaritan	Sumiä	Aroā
Arabic	Semavati	Ardi
Modern Arabic	Ssamvat, Shema, Telek	Arz, Ardh, Auf, Turap, Aalem
Maroccan	Smavat	Ord
Ethiopic		
Geez	Samaiat	Mydrni
Tigri		Midre
Amharic	Samai, Sämäie	Mydrm, Medre, Medere
Hauasa	Szemmey	Middrih
Maltese	Sema, Smeviet, Smezijet	Art
8. LYCIAN	(*Son*, Tidaimi ; *And*, Atbi)	
9. PHRYGIAN	(*Bread*, Bek ; *Water*, Bedü)	
10. GREEK	Ouranos	Ge
Romaic	Ouranos	Ge
11. GERMANIC, 360	Himina, Himins	Airtha
Alemannish, 720	Himil	Erdu
Classical German	Himmel	Erde
Transylvanian German	Hemmel	Jerde
Jewish Germ.	Himal	Hardi
Low Saxon	Himmel, Hemel	Eere, Erde
Frieslandish	Hiemmel	Jerde, Yrtrik
North Friesl.	Hemmel	Eerde, Wroll
Dutch	Hemel	Aerde, Eertryke, 1270
Danish	Himmel	Jord
Norwegian	Himmel	Jord, Jera
Orkney	Chimrie	Yurn
Icelandic	Himne	Jord
Swedish	Himil, Himirik	Jord, Jordriki
Dalecarlian	Himblum	Jord
Gothlandish	Hymblum	Tord
Danish Saxon, 880	Heofena	Eortha
English, 1160	Heaven	Eorth, Yearth
12. CELTIC		
Irish	Neamh, Nau	Italamh, Thallamh, Talu
Gaelic	Neamh	Talamh, Dtalmhuin
Manks	Niau	Tallu
Walden	Neambh	Talmhin
Cimbric		
Welsh	Nefoedd, Nef	Ddaear
Cornish	Neau, Nev	Nore
Brittanish	Eon, Euff	Duar, Dovar
13. ETRUSCAN	(*Bread*, Puni, Urtu)	
14. LATIN	Cœlum	Terra, Tellus
Italian	Cielo	Terra
Piedmontese	Siel	Terra
Waldensic P.	Cel	Terra
Genoese	Ze	Terra
Onsernone	Ciel	Terra
Venetian	Zielo	Terra
Friulian	Cil, Ciil	Tiarra
Valais	Cel	Terraz
Bolognese	Cil	Terra
Sicilian	Celu [Quelu	Terra
Sardinian	Cel, Chelo,	Terra
Spanish		
Castilian	Cielo	Tierra
Catalonian	Cel	Terra
Galician	Ceo	Terra
Portuguese	Ceo	Terra
Romanish	Ciel, Tshiel	Terra
Provençal	Cel	Terra
French	Ciel	Terre
Bearnish	Cèou	Terro
Rovergne	Cel	Terro
Flanders	Ciel	Terre
Walloon	Cir	Ter
Wallachian		
Dacian	Tsheri, Czelurg	Pämentiv
Cutzo-Wallachian	Cerio	Pimchita
15. CANTABRIAN	Sseru	Lurre
16. SCLAVIC		
Sclavonian		
Russian Church	Nebesi	Semli
Common Russian	Nebö	Semlä
Malo-Russian	Nebo	Zemlä
Susdalian	Nebo	Zemlā
Servian		
Uskok	Nebesse	Semli
Ragusan	Nebbu	Semgli
Transylvanian Scl.	Nibe (*Bread*, Liab)	
Croatian	Nebi, Nebiesi	Semlji
South Wendish	Nebi	Semli, Krai
Hungaro-Wendish	Nebi	Semi
Polish	Niebie	Siemie
Kashubish	Nebo	Ziemie
Bohemian	Nebi, Wnebi	Semi
Serbian, Upper Lusatia	Niebiu	Semi
Serbian, Lower Lusatia	Nebu	Semi
Polabish, 1691	Nibis, Nebui	Ssime
Lithuanian		
Old Prussian	Delbes, Dangon	Semie, Worsinny
Prusso-Lithuanian	Debsissa, Danguje	Zemes, Sjemes
Polono-Lithuanian	Danguose	Ziame, Ziames
Crivingian	Dangus	Zemme
Lettish Proper	Debbes	Semmes, Zemmo

III. TATARIC CLASS.

i. SPORADIC ORDER.

17. TSHUDISH		
Finnish	Taiwas	Maa
Olonetzish	Taiwag	Ma
Carelish	Taiwag, Taivazh	Mua, Müa
Esthonian	Taewas	Ma
Livonian	Tauwis	Maal
Laplandish	Almen, Almism, Tsiätse	Aednemen
18. HUNGARIAN	Menny, Meneg	Föld, Fjeld, Mezon
19. ALBANIAN	Kiel, Kielt	Zee, Sje, Be
Calabro-Alban.	Chielue	De
Siculo-Alban.	Chiex	Dee

ii. Caucasian Order.

	Heaven, Sky.	Earth.
20. Armenian	Hierkins, Girkin, Ergink	Hierkri, Gerkrii, Erkir, Tap, Huoch
21. Georgian	Tza, Zata	Sze, Miza, Kwekara
Imirettish	Tshash	Dikha
Mingrelish	(*Bread*, Tshkomi)	Dicha
Suanetish	Tsah	Gim
Tushetic	(*Bread*, Mak)	Jobste
22. Abassan	Agughan, Ashnan	Astula, Tshüllah
Kush Hasib	(*Bread*, Tshakua Makua)	Tula
Alti Kesek	(*Bread*, Mikel)	Tzula
23. Circassian	Wuafä	Tshi, Jaethae
Cabardinish	Phemeh (*Bread*,	Tshach)
24. Ossetish	Arv, Arwi	Tshigit, Segh, Stil
Dugorish	Arf	Gukh
25. Kistic	Sigelich, Stuigley	Late, Mezha, Ghumm
26. Lesgian		
Chunsag	Zo, Zob	Ratl
Avaric	Zuv	Bak
Dido	Zub, Zuv	Tshedo
Kasi Kumük	Sur	Kerki
Andi	Teshin	Misa, Bisa, Tshur
Akushan	(*Bread*, Katz, Zulhe)	Mussa, Musseka
Kubeshan	Zub	Muza
Kalalatish	Reshin	Unshi

iii. Tartarian Order.

	Heaven, Sky.	Earth.
27. Turco-Tartarian		
Caspian		
Turkish	Gug, Kiokler, Chiojler	Jer, Gyr, Kher, Ber
Bucharian	Telek, Asman, Kukliar	Zämin, Chak, Jusjurd
Crimean	Gug, Ghiogh, Chok, Kok	Gier
Nogaic	Kuk, Heda	Er, Toprak
Cumanish	Kuk, Kek, Kik	Jer
Kasanish	Kuk, Tengeri, Samoh	Ger, Ars
Mestsheretskic	Kuk	Jer
Bashkiric	Kuk, Ava	Jer, Dzhir
Tobolskic	Auva, Asman	Irjo, Gir, Jir
Kirgishic	Kiuk, Asman	Dzher
Tarary	Auva, Asman	Jir
Tomskic	Kok, Asman	Jer
Turetish	Gkiok, Gioch	Toprak
Tshulimic	Tengri	Jer
Jeniseic	Tengeri	Tobrak, Dzhir
Kuznetic	Tengeri	Jer, Tsher, Toprak
Barabish	Asman, Hava	Der
Usbek, Chivinic	Asman	Jer, Toprak
Teleutic	Tegir, Tengeri	Cir, Jer, Toprak
Jakutic	Tagara, Chaltan	Sirr, Jeme, Bor
Tshuwashic	Püllu, Pilt, Sundalük	Sir, Ser
Mongol	Tingri	Dere, Gadzar, Shiroi
Burattish	Tingeri	Gazar
Calmuck	Octorgoi	Gasar, Ertjajaze
Tagurian	Tengri	Kaaziar
28. Mantshuric	Abka, Appia	Na
Sagalien	Hurara (*Day*, Jangsey)	Ki ?
Corean	Hanel, Tshen	
29. Tungusic	Negdau, Nian, Dshiulbka	Endra, Dunda, Tor
Nertshinic	Tingeri, Nengne, Nai	Turu
Jeniseic T.	Nengne	Dunda
Mangazeic T.	Nangna	Tukala
Barguzinskic	Nengna	Dunne
Angarian	Nengne	Tukalagda
Jakutic T.	Nengne, Nenone	Dundra
Ochotskic	Nän	Tor
Lamutic	Nana	Tuor
Tshapogiric	Negie	Dunda

iv. Siberian Order.

	Heaven, Sky.	Earth.
30. Permian	Olanün, Kümar	Ma, Mu
Sirjänish	Jen esh, Nebus	Mu
Wotiak	Wülün, Küldenjumar, In, Immun, Tslim küd	Musüm, Sioi
31. Wogulic	Eterdarum	Maanku
Tshussovic	Tarom, Nair	Ma
Verchoturic	Numma	Ma
Tsherdymic	Tul	Ma
Berezovan W.	Soum	Mag
32. Ostiak	Nopkon	Jogodt
Berezovan O.	Nomen, Numtorem, Saika	Müg, Mü
Narymic	Nusunde	Müg
Joganic	Ninnäk	Müch
Lumpokolic O.	Num torom	Müch
Vashuganskan	Torom, Jom	Tagai
Tazian	Lom	Tshvotsh
33. Tsheremissic	Kiusiuluste, Küshna juma, Pil, Pil pundash, Joma, Tünja	Ijulmin, Melentesta, Rok, Mlande, Mulens, Zäntiulek
34. Morduin	Mänel, Werepass, Mänen	Mastor, Moda
Moktanic	Shkai	Mastör, Moda
35. Teptjerai		
36. Samojedic		
Archangel	Numilembarti	Jae
Pustozerskan	Nunära	Ja
Oby	Num, Nomün	Joä, Ma, Mogh
Juratshic	Nub	Ja
Mangazeic S.	Podassie	Dä
Tawgish	Nuonto, Nuon, Ngoa, Noä	Mamoru
Turucanish	Na, Teiga	Ja, Baddu
Tomskic S.	Nom fünde, Lom	Tuetsh
Narymic S.	Tit	Tuetsh
Ketish	Tita	Tuetsh
Timskic	Tit	Tütsh
Caragassic	Tit, Tere	Tütsh, Dsha
37. Camashic	Num, Ti urach	Dsha, Dzhu
Taigish	Numuidi	Dzha
Koibalic	Num	Dshu, Dzhu
Motoric	Orgochairachan, Num	Dsha, Dzha
38. Jeniseiostiak		
Arinic	Oes	Peng
Kotovic	Eish, Eish pa rang	Pang
Assanic	Oesh	Pang
Inbatshic	Es	Bang, Bach
Lumpokolic J.	Etsh	Bing
39. Jukadshiric	Dsjunga, Zjugo, Kundshu	Leviangh, Lewjie
40. Koriac	Kh'igan, Cherwol, Chaän, Eiäan, Jan	Nutolũt, Nutelchan
Kolymic	Chaĩn	
Tigilic K.	Küsha	Nutelchan

Language.	Heaven, Sky.	Earth.
Karaginic	Shilchen	Niutiniut
Tshutshic	Keh'quin, Chervol, Chiternik, Killak, Ging, Keilak	Nultenut, Nunä
(Greenland and Eskimaux)		Nuna
41. Kamtshatkan	Kochan, Hai	Simmt, Nutä
Tigilic K.	Keis	
Srednish	Kochal, Kollaa	Semtüshimta
Jozhnyshic	Kogal	Sümmit

v. Insular Order.

Language.	Heaven, Sky.	Earth.
42. Curilee	Niss	Kotan
43. Eastern Islands	Inkak	Tshekak
44. Japanese	Ten	Tsatsmo, Cino, Ci, Tji, Dsi
45. Leu Cheu	Diänni	Zudshi
46. Formosan	Vullum, Tounnoun	Nay, Nai
47. Philippine		
Moluccan	Languin, Surga	Buchit, Dunga
Magindanao	Längit	Lopä
Tagalish	Langit	Lupa, Tana
Bissayish	Langit	Yuta
Sulu		
Bugis	(*Day*, Aso; *Sun*, Mataso)	Tana
Mungharar	(*Day*, Alo; *Sun*, Matalo)	Bûtta
Pelew	Yängley (*Day*, Kokuhk; *Bad*, Mogull)	
Mariana	Languit	Tano
Friendly Isl.	Elandshi (*Food*, Maa)	Tuguta
Coco Islands	(*Food*, Maa)	Kille
Savu	Liruh	Vorai. Rai
Pampang		Labuad
New Guinea	Bar	Taar. Behoul
New Britain		Nabagr ?
Bima	(*Sun*, Mataliro)	Dana
Sumbawa	(*Sun*, Matahari)	Bumi
48. New Holland, E.	Kere	Poapoa, Popo
49. Van Diemen's Land	(*Father*, Bina)	
50. New Caledonian	Ndaoè	Guiahse. Do
51. New Zealand	(*Bread*, Eei; *Bad*, Kino)	Uenua
Otaheite	Erai (*Food*, Maa; *Bad*, Ino)	Hwennua
Marquesas	Tahua, Hani	Hwenua
Sandwich Isl.	Harani (*Bad*, Ino)	Motu
52. Easter Isl.	(*Father*, Mama)	Soupe, Henua

IV. AFRICAN CLASS.

Language.	Heaven, Sky.	Earth.
Egyptian		
Coptic, Memphitic	Phe	Kahi
Sahidic, Thebaic	Pĕ	Kahe, Kahı
Bashmuric		
Oasitic	Pē	Kĕhi
Barabrish	Szemma	Iskitta
Kensy, Burckhardt	Semeyg (*Day*, Ougresk)	Aryd
Nouba, B.	Sema (*Day*, Aly)	Gourka
Bishareen, B.	Otryk (*Day*, Toÿ)	
Adareb, Salt	(*Day*, Ombe)	Tobút
Argubba	(*Father*, Anathien; *Head*, Dimmaha)	
Massowah	(2, Killot; 3, Szälis)	
Arkeeko, Salt	Astur (*Sky*) (*Day*, Ummet)	Midur
	(2, Kille; 3, Selass)	
Suakin	Tebre	Wuhash
Shiho, Salt	Aroan	Baru
Takue, Salt	(*Man*, Grua; *Water*, Ane)	
Barea, Salt	(*Man*, Ookooi; *Water*, Umba)	
Mutshuana, Salt	(⊙, Let chachi; ☽, Wirri) See *Beetjuana*	Lehachi
Briqua, Salt	(1, Oonchela, 3, Taroo, Miraroo)	
Shangalla, Salt		
Darmitchequa	Goza, *Sky* (⊙, Woka; ☽, Beja	Enniah
Tacazze	Quegah, *Sky* (⊙, Wah; ☽, Terah)	Hugga
Makooa, Salt	(⊙, E-zoo-ah; ☽, Mare)	E-la-poo
Monjou, Salt	(⊙, D"yoova; ☽, Mooeize) [" a catch or click]	Mooze
Sowauli, Salt	(1, Chemo-je; 3, Ma-da-too)	
Somauli, Salt	(⊙, Ghur-rah; ☽, Tai-ya; 1, K'ow; 3, Sud-de)	
Hurrur, Salt	Semme (⊙, Eer; ☽, Werke; 1, Ahad)	Di-che
Galla	Ivaq (⊙, Adda; ☽, Dje-á, Ba-te, S.)	Laf-fa, S.
Adaiel, Salt	(⊙, Airo; ☽, Al-sa)	Ba-ro
Danakil, Salt	Am-boo re, *Sky*,	Arde, Barroo
Dungolish	Szemma (⊙, Ayero; ☽, Al-sa, Berra)	Arikha
Bornou, Burckhardt	Perg	Tsedy
Borgo, Burckhardt	Sema (*Day*, Dealka)	Berr
Darfur	Szemma (⊙, Dule; ☽, Doal, *Salt*)	Suru, Szura
(Amharic) Salt	(⊙, Tsai; ☽, Tckerka)	Mider
(Tigre) Salt	(⊙, Tsai; ☽, Werke)	Midre
Agow, Salt	(⊙, Quo-rah; ☽, Er-wah)	Ziv-va
Tsheraz A.	(*King*, Negumani; *Song*, Mossägan)	
Damot A.	(*King*, Negus; *Song*, Mazenä)	
Gafat	(*King*, Negus; *Song*, Aedje)	
Falasha	(⊙, Kuara; *Song*, Baze)	
Soudan	(1, Deja; 3, Oku)	
Begirma	(1, Kidde; 3, Metta)	
Fulah	Hyalla	Lehidy
Phellata	Szemma	Lissedi
Yalofs	Assaman	Souffe
Berber	Ginna, Tigot, Igna (⊙, Tafogt)	Doonit, Akal
Canary	Titogan, Ataman (*King*, Monsey)	
Tibbo	(1, Trono; 3, Aguesso)	
Shilluh		Berr
	(⊙, Atfuet)	
Sivah	(⊙, Itfuet)	
Sereres	Rogue	Lanceh
Serrawallis	(1, Bani; 3, Sicco)	
Mandingo	Santo	Banko, Binku
Yallonka	Margetangala (1, Kidding)	
Sokko	Bandee (1, Külle)	
Felups	(1, Enory; 3, Sisajee)	

	Heaven, Sky.	Earth.
Timmaney, Winterb.	(1, Pin; 3, Pisaas)	
Bullam	Foy (1, Bul, Nimbul; 3, Rah, Ninraa, Wint.)	Upock Leh
Susu	Araiani	Bohhe
Fetu	Araiani	Arádde
Kanga	Nesua (1, Aniandu)	
Mangree	Tata (*Head*, Tri)	
Gien	Lam (1, Do)	
Quoja	(*King*, Dondag; *Head*, Hunde)	
Fante	Niame	Assasse
Akripon	Aduankam (1, Ehoo)	
Amina	Jankombum (1, Akkun)	
Akkim	Jahinne (*Head*, Metih)	
Akra	Ngoi, Jankombum?	Sipong
Tambi	Giom (*Father*, Tshiàh; *Head*, Ii)	
Whydah	(1, De; 3, Otton)	
Papua	Jiwel (1, Depoo)	
Watje	(1, De; 3, Etong)	
Calbra	(1, Barre; 3, Terre)	
Camacons	(1, Mo; 3, Melella)	
C. Lobo Gonsalvas	(*King*, Sauepongo; *Bad*, Mondello)	
Loango	Iru (1, Boosse; 3, Tattu)	
Congo	Sullo	Toto
Angola	Maulu, Beulu	Boxi, Toto?
Mandongo	Sambiampungo (1, Omma; 3, Metatu)	
Camba	Julo (1, Moski)	
Angola, Hervas	Monte	Aamano
Karabari	Elukwee (1, Otuh)	
Ibo	Tshukko, Ellu (1, Otuh)	
Mokko	Ibanju (1, Kià)	
Wawu	Barriadad (1, Baba)	
Tembu	So (1, Kuddum)	
Krepeer	(*Bread*, Apohae; *Head*, Ota)	
Assianthes	(*Bread*, Abodo; *Head*, Otri)	
Kassenti (Bornu)?	Ktak (1, Obaa)	
Affadeh	Dilko	Ftüng
Mobba	Szemma	Barr
Shilluh (Darfur)	(1, Warre; 3, Koddus)	
Darrunga (Gallas)	(1, Kadenda; 3, Attih)	
Shaggai	(*Soldier*, Gonso)	
Madagascar	Danghitsi, Langhitsi, Lainch, Atemco	Tane, Tanne, Zanne
Lagoa Bay	(1, Chingea; 3, Trirarou)	
Koossa	Isuhlu	Umtsllaha
Beetjuanas	Maaro	Lehaatsi
Mutshuana	(1, Oonchela; 3, Taroo, Miraroo)	Lebochi
South Caffres	(1, Enje; 3, Atatu, Zintate)	
Hottentots	Inga?	Ki, Kōo, Qu'au Gamkamma
Coranas	(1, T’”köey)	T”kehaub
Saldanha Bay	Homma	Hü
Bosjemans	T”gachuch	T”kanguh

The Hottentots have three particular clicking sounds, made by withdrawing the tongue from the teeth, the fore part and the back part of the palate: they are respectively denoted by T’, T”, and T’”. The first two appear to resemble the sounds sometimes used to express a trifling vexation, and to make a horse go on, or to call to poultry.

V. AMERICAN CLASS.

i. South American.

	Heaven, Sky.	Earth.
A. Southern Extremity		
1. Terra del Fuego	(A. *Penguin*, Compoggre)	
2. Patagonia, Chili		
Moluchan. Araukan	Huenu (⊙, Antu; *Hill*, Calul)	Tue mapu
Tehuelhet	(*Hill*, Calille)	
Puelche	(*Hill*, Casu)	
B. E. from R. Plata to Marañon		
3. Charrua		
4. Yaro		
5. Bohane		
6. Chana		
7. Minuane		
8. Guenoa		
9. Karigua		
10. Guarany	Ibag, (⊙, Cuarazi)	Ibi
South		
West		
North. Tupi, Brazil	Ibaca	Ibi
C. E. of Paraguay		
11. Brazilian dialects		
Common	(⊙, Arassu; 1, Gipi; 3, Busapu; 4, Busapu munan gipi; 6, Busapu sapu Arndt)	
Kiriri	Arakie	Bu
Curumare	(*God*, Aunim)	Rada
Forty-nine others unknown.		
D. W. of Paraguay		
12. Aquiteguedichaga		
13. Guato		
14. Ninaquiguila		
15. Guana		
16. Mbaya, Guaikur	Titipi guime	Jego
17. Payagua		
18. Lenguas		
19. Enimaga		
20. Gulentuse		
21. Yacurure		
22. Machikuy		
23. Mataguaya		
24. Malhalae		
25. Pitilaga		
26. Toba	Piguem	Alua
27. Abipon	Ipigem	Aaloa, Aaloba
28. Mocoby	Ipiguem	Aloba
29. Aguilot		
30. Chumipy		
31. Vilela	Laue	Basle
32. Lule	Zo (*God*, Ano)	Ama, A.
E. Coast of Peru		
33. Quichua	Hanacpacha; Hanac? (⊙, Inti)	Caypacha, Cay? Allpa
34. Aymara	Alapacha, Alai	Acaphan, Aca? Urakke
35. Puquina	Hanigo	Cohua

	Heaven, Sky.	Earth.
36. Yunka Mochika	Anguic	Capuc
F. East of Peru		
37. Samuca	Guiate	Numitie, Nup
38. Chiquitos	Ape	Aaqui, Quiis
39. Moxos	Anamocu	Kiere, Motehi
40. Mobimi	Benrra	Yanlo, Llacamba
41. Cayubabi	Idah	Idatu
42. Itonami	Numane ?	Nicosnone ?
43. Sapiboconi	Euocuepana	Mechi
44. Heresibocana		
45. Canesiana		
46. Pana		
47. Rema		
48. Pira		
G. East of Quito, on the Maranon		
49. Aquanos, Xeberos		
50. Mainas	Inapa	Isse
51. Yameos	Arresiuma	Popo
52. Omagua, Yurumagua	Ehuatemai	Tuyuca
53. Yahua ; 100 more		
H. From R. Negro to Oronoco		
54. Maipuri	Eno	Peni
55. Salivi	Mume	Ada ? Seke ?
56. Guaivi, Ciricoa		
57. Achagua		
I. About Casanare		
58. Yarura	Ande	Dabu
59. Betoi	Ubu, Tentucu	Umena ? Ajao ? Dafibu
60. Situfa, Girari		
61. Ottomak	Caga	Poga
62. Guama, Guaneri		
K. North Coast	Cap	
63. Tamanac		Nono
64. Arawac	Aijumũn, Kassakku	Wunabu
65. Carib		
Yaoi	Oubecou	Monha
Islands	Capou	Soye
L. Mountains in the N. W.	Men	Nonum
	Women	Monha
66. Muysca	(⊙ Sua ; *Man*, Muysca)	
67. Kiminzac		
68. Popaya		
69. Darien	(⊙ Nie ; Cupego : 3, Pauquah)	

ii. MIDDLE AMERICAN.

	Heaven, Sky.	Earth.
A. Islands		
1. St Domingo	(*Field*, Conuco ; *Meadow*, Savana ; *House*, Boa ; *Bread*, Casabi)	
B. Darien to Guatimala		
2. Kiche, Utlateca		
3. Poconchic	Taxah (⊙, Quih ; *Head*, Na ; *Hand*, Cam ; *Bad*, Tsêri)	Acal, Vleu
4. Yucatan, Maya, Caanné	(⊙, Kin ; *Hand*, Cab)	Luam
C. Table-Land of Mexico		
5. Mixtecan	Andihui, Andi	N̄uuñaihui, N̄uñai
6. Totonacan	Tiayan, Acapon, Acapaian (1, Tom ; 3, Toto)	Nitiet ?
7. Mexican, Aztekan	Ilhuicatl (⊙, Tonatiuh ; 1, Ce ; 3, Yei)	Tlalli
8. Huastecan	Tiaeb (⊙, Aquicha ; *Head*, Nâ)	Tzabal
9. Othomi	Mahêtzi	Chimohòi, Hoy
10. Mechoacan		
11. Pirindan	Pininte	
12. Tarascan	Avandaro (1, Ma ; 3, Tanimo)	
D. California to Ri del Norte		
13. Coran	Tahapoa	Chuèhti
14. Tepehuana, Topia		
15. Tubar	Tegmecarichui	Nuniguatae
16. Tarahumaran	Guami ? *Bad*, Tseti ; *Dog*, Cocotshi)	Guè
17. Zuaquan, Yaqui	Tevecapo	Buyapo
18. Pima	Titauacatum ? (*I*, Ani ; 1, Mato ; 3, Waik)	Inatuburch ?
19. Eudeve	Tevictze ?	Yuhtepatz ;
20. Opata	Tequiaca ?	Terepa ?

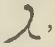
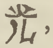
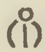
iii. NORTH AMERICAN.

	Heaven, Sky.	Earth.
A. N. W. of New Mexico		
1. Jetan, Apache		
2. Keres, Moqui		
B. About California		
3. Pericu		
4. Waicuric	Tekericadatemba (⊙, Ibo, Ibunga ; ☽, Gomma, Ganehma)	Datemba
5. Cochimi, Laymon	Ambayujui, Ambeing	Keammetè, Amet, Ametetenang
C. N. of California		
6. St Barbara	(*Head*, Necchù ; 1, Pacà ; 3, Mapja)	
7. Eslene	Imita (⊙, Tomanis ashi ; 1, Pek ; 3, Julep)	
8. Runsien	Terray (⊙, Orpetuei istmen ; 1, Enjala ; 3, Kappes)	
9. Achastlien	(1, Moukola ; 3, Capes)	
10. Ecclemach	(1, Pak ; 3, Ullef)	
D. About Nootka		
11. Nootka Sound	Nas, Inaihl nas (⊙, Opulsthl ; 1, Tsawak ; 3, Catsa)	
12. Atnah	(*Water*, Shaweliquoih ; *Head*, Scapacay)	
13. Friendly Village	(*Water*, Ulkan ; *Fire*, Neach)	
14. Queen Charlotte's Island	(*Fire*, Tesh ; 1, Sounchou ; 3, Slōōnis)	
15. Colushan	Ki, Keu, Kiiwa, Kitani, Kügon, Chaaz	Tljaknak, Tlatka, Tlekw, Tka, Shü, Tlinkitaannü
	(*Stone*, Te ; Mex. Tetl)	

	Heaven, Sky.	Earth.
16. Ugaljachmuzi	Koas (*Throat*, Katkatl; Mex. Cocotl. "*Boil*, Coatk; Mex. Coxitia")	
17. Tshinkitany	(⊙, Krane; 1, Clerg, Kaike; 3, Notshk, Netx)	
18. Kinaizi	Jujan, Juon, Jugan An,	Altnen, Alslen
E. W. of Mississippi		
19. Blackfooted Indian	(1, Tokes-cum; 3, Nohokescum)	
Blood Indian, Pegan		
20. Tall Indian	(1, Karci; 3, Narce; 4, Nean)	
21. Sussee	(1, Ut-te-gar; 3, Taukey; 4, Tobo)	
22. Snake Indian		
23. Nadowessian	Uohta tibi (⊙, Paetâ; ☽, Oweeh)	
Assinopoetuc	(*Dog*, Shong; 4, Tope)	
Sioux		
24. Saki, Ottogami Menomene		
25. Osage	(*Wind*, Tattasuggy; [*Brothers*, Tinaitauna?])	
Winnibeg, Maha		
Missouri, Oto		
Arkansa, Kanze		
26. Pani		
27. Caddo, Natshitotshe		
28. Adaize, Attahapa		
F. W. of Mississippi, to Ohio		
29. Floridan, Apalache	(*Agreeable*, Hitanachi; *Priests*, Jaoiia)	
30. Timuacan	(*My*, Na; *Elder Brother*, Niha; 1, Minecotamano; 3, Nahapumima)	
31. Natshes	(⊙, Oua, chill)	
32. Muskohge, Creek	(⊙, Hashseh, Husá; 1, Hommai, 3, Tootshēna)	Ecaunnauh
33. Chikkasaw Choktaw	(⊙, Hashe, Hasce; 1, Chephpha; 3, Tootshēna)	Yahkanè
34. Cherokee	(⊙, Eusse, Anantoge calesta; *Fire*, Cheela; 1, Soquo)	
35. Woccon	(⊙, ☽, Witapare; *Water*, Eau; 1, Tonne; 3, Nammee)	
36. Katahba	(⊙, ☽, Nooteèh; *Water*, Ejau)	
37. Six Nations	Karongiage, Cauroun-kyawga, Kaaronhiate, Toendi	Oo-hon-cha, Owhoncheat, Ahunga, Ohunjea, Uchwuntskia, Ondeehra
Mohawk	(*Fire*, Ocheeleh)	
Seneka		
Onondago	(*Dog*, Chierha)	
Oneida		
Cayuga		
Tuscarora	(☽, Hatshe-nyahah; *Water*, Auweau; *Dog*, Cheeth)	
G. W. of Hudson's Bay, and S. W.		
38. Chippeway of Del.	(*Tooth*, Tibbit, Wibit; 3, Taghee; 4, Neon, Nea)	
39. Delaware	(*Tooth*, Weepeet)	
40. Algonkin Mohegan	(*Tooth*, Tibit; 4, Neou)	
41. Shawanno *Pampticough*	Spimiki (*Tooth*, Nepittalleh)	Assiskie
42. Miami, Illinois	Kechekoué (⊙, ☽, Kilswoa; *Tooth*, Neepeetah)	Akilikeoué
43. Kikkapoo	(⊙, ☽, Kishessu)	
44. Piankashaw		
45. Pottawatameh	(*Tooth*, Webit)	
46. Delaware	Acoossagame *Tooth*, Weepeet)	Achquidhackamicke, Agi, Hogkey
47. Minsi	(*Tooth*, Wichpit)	
48. Sankikani	(*Tooth*, Wypyt)	
49. New Sweden	"Hocque" (*Flesh*, Jos)	[Hocque
50. Narraganset	Keesuck (3, Nish)	Aucke
Natik	Kesuk (3, Nishnoh)	Ohke
51. New England	(*Tooth*, Mepeteis; 3, Nis)	
52. Abenagui		
53. Mohegan	Spummuck (*Tooth*, Weepeetan)	Hacki, Nohnkey
54. Penobscot	(*Tooth*, Weebeetah)	
55. Souriquois	Ouajek (⊙, Kissis; *Tooth*, Nebidie)	Megamingo
56. Micmic	Oaiok	
57. E. Chippeway	Speminkakuin	Aukuin
58. Messisauger	(⊙, Keeshoo)	Nindohockee
59. N. Algonkin	Spiminkakuin	Ackouin, Acke
60. Knistenaux	(⊙, Pisim; *Head*, Us-ti-quoin; 4, Neway)	Messe asky
61. Nehetawa	(4, Naou)	
62. Skoffie	(*Head*, Mestichee)	
63. Mountanee	(*Head*, Teekechee)	
64. W. Chepewyan Mack.	(⊙, ☽, Sah; *Head*, Ed-thie)	
65. Nagail	(*Head*, Thie)	
66. Hudson's Bay Islands	(*Head*, Tenet thie)	
H. North Coasts		
67. Greenland	Killang, Killak (⊙, Ajut, Seckanach; ☽, Anningat; 1, Attausek; 3, Pingasut)	Nuna
68. Eskimaux	Taktuck, Nabugakshe (⊙, Sukkinuch; ☽, Tatcock)	
69. Tshugassic	Koilak	Nuna
70. Norton Sound	(*Hand*, Aishet; 1, Adówjack; 3, Pingashook)	
(71.) Tshuktshe	Keïlak	Nuna
71. Jakutat	Kilag	Nuna
72. Konäge, Kadjak, I. or Kikhtak	Killach (*Hand*, Aiget; 1, Alchallack; 3, Pingaic)	Nuna

The tables will at least serve, notwithstanding some imperfections and uncertainties, as a convenient synopsis for facilitating the reference to a brief sketch of the history of the different families of languages.

1. The strongest proof of the great antiquity of the CHINESE language appears to be the extreme simplicity of its structure, and the want of those abbreviations and conventional implications which have been sometimes called the wings of languages. It is natural that, in attempting to express ideas at once by characters, the rude pictures of material objects should first have been principally, if not exclusively traced; thus the Egyptians had ⊙, ☽ for the *sun* and *moon*, and ⊕ for a country or *field*, and the Chinese have still 日, 月, 田 for these objects respectively, the characters having been made square instead of

round, which some of them were in their more ancient forms. The Egyptians represented a *man* by a figure kneeling, and stretching out his hand, or, in the enchorial character, thus . The Chinese figure may originally have been of the same form; but at present is more like a pair of legs only, , whilst a *dog* seems to have three or four legs; or . A thousand, according to Mr Jomard's ingenious conjecture, was copied from the lotus, with its seed vessel, having a great multitude of seeds, and the Chinese is certainly not altogether unlike the Egyptian , nor is the character for light , which seems intended to represent a radiant body, altogether different from the  or so often found among the hieroglyphics of Egypt, although it is not easy to believe, with Mr Palin, that the manuscripts found with the mummies agree precisely with a Chinese version of the Psalms of David, character for character. The successive introduction of figurative expressions and characters may easily be imagined; but it would be useless to enter at present into further details of this kind, on grounds almost entirely speculative. The Chinese are said to have been, in the ninth century, a race of people resembling the Arabs; their physiognomy was contaminated in the thirteenth and fourteenth by a mixture with their conquerors, the Mongols; but their language remained unaltered. The dialect of *Tonkin* is sometimes called the language of *Anam*, and the *Guan;* on occasions of state they use the Chinese character, but more commonly a character of their own, probably resembling that of the Siamese. Dr Leyden observes, that at least twenty different nations employ the Chinese characters, though they read them quite differently; and he considers the Cochin-Chinese, the Cantonese, and the Japanese, as all essentially different from the Mandarin Chinese, though they have all some words in common. He gives us as the names of the dialects of Chinese, constituting almost as many separate languages, 1, *Kong*, spoken at Canton; 2, *Way;* 3, *Nâm;* 4, *Chéw;* 5, *Séw;* 6, *Lŭi;* 7, *Limm;* 8, *Khum*, or Mandarin; 9, *Síu;* 10, *Kunng;* 11, *Hyong san*, spoken at *Macao;* 12, *San tahk;* 13, *Nam kéi;* 14, *Pún ngi;* 15, *Tòng khún;* 16, *Fo khun*, or *Chinchow.* There is also a language spoken by the *Quan tô*, between Tonkin and China, a people who consider themselves as more ancient than their neighbours. Notwithstanding, however, all this supposed diversity, we may trace a considerable resemblance in the spoken language, even as far as Corea. In all these dialects, the conversation is a sort of recitative, and the different notes give distinct meanings to the words; as in fact we distinguish in English the sense of M? from M! or simply M.; tones perfectly understood, though never written. The Chinese are without the sound of the letter *r*, and several other sounds common in Europe; the only way in which they express foreign words is by putting together the characters of the nearest import, with a symbol of pronunciation annexed to them; thus, for *Christus* and *Cardinalis*, they are obliged to write *Ki lu su tu su* and *Kia ul fi na li su*, with a mouth annexed to them. The names of places are generally distinguished by a square enclosing the characters which express them, and the names of men, in some books, by a line drawn on one side of the characters only. In this there seems to be a distant analogy to the ring which encloses proper names in the Egyptian inscriptions, but the names of places were not distinguished in this manner by the Egyptians. The dialects of Cambodia and Laos have received some mixture of Malayan from their neighbours; in writing the former of these, sometimes called *K'hôhmen*, according to Dr Leyden, the Bali, or old Sanscrit character, is employed; and the latter has some analogy with the Siamese; indeed, both the Siamese and the Avanese are disposed to derive themselves from Laos. It may be seen, from the specimens exhibited in the article PHILOLOGY, that at least some of the Chinese dialects have sounds agreeing in several instances with European words of the same import; but the agreement is scarcely precise enough to justify our inferring from it an original connection between the languages.

2. The language of SIAM resembles the Chinese in its simplicity and metaphorical structure, though not so decidedly monosyllabic. It is obvious, however, that the distinction of monosyllabic and polysyllabic could not, in very ancient times, have been so positively laid down as at present, since it was usual, in almost all countries, to write the words contiguous to each other in a continued series, without any divisions between them; and, even in modern printing, there is a happy invention, which often restores this agreeable obscurity, under the name of a hyphen, by the use of which we avoid the difficulty of determining whether we wish to employ one word or several. The Siamese call themselves *T'hay;* and a part of their country is distinguished by the appellation Tai hai, or Great T'hay. The numerals resemble the Mandarin Chinese; several words of the language are borrowed from the Bali; it is written in an alphabetical character, which is said to be complicated and refined.

3. The AVANESE or *Burmanish*, has also borrowed some polysyllabic words from the Bali, and is written in a peculiar alphabetical character. It must be considered as an era in the history of this country, that its emperor has employed Mr Felix Carey, at his own expense, to establish a printing press at Ava, his metropolis, for printing a translation of the Scriptures in Burmanish. A dialect, spoken in the district called Tanengrari, is said to be of greater antiquity. The *Môn* or *Peguan* is called by Dr Leyden a distinct original language; but it is written in the Avanese character, and Adelung's specimen scarcely differs at all from the Burmanish. The language of Arakan and Rashaan is called *Rukheng;* it contains a number of words from the Bali, many of them converted into monosyllables by an imperfect pronunciation. Dr Leyden considers it as the connecting link between the monosyllabic and the polysyllabic languages; and he calls it an original language, notwithstanding its acknowledged derivation from its neighbours. It employs the Devanagri alphabet, including the letter R. Out of fifty words of Rukheng, quoted by Buchanan, the seven which are not Burman are only varieties of pronunciation. The *Kiayn* or *Kolún*, and the *Kukis*, north-east of Chatigong, are mentioned as neighbouring tribes, speaking languages almost entirely different from the Rukheng. We find, in Mr Buchanan's paper, some specimens of the languages of the Burma empire, which it is difficult to distribute methodically without a further knowledge of their peculiar characters, but some of which may, without impropriety, be introduced here.

		Earth.
Myammaw, in Burma	(*Head*, Kaung; *Wind*, Lae)	Myacgee
Yakain, in Arakan	(*Wind*, Lee)	
Tanaynthoree		
Yo	(*Stone*, Kionkag)	

		Earth.
Moitag, near Assam	(*Head*, Kop, Kok; ⊙, Noomeet)	Leipauk
Koloun, or *Kiayn*	(*Head*, Multoo; ⊙, Konee)	Dag
Kurayn or Kaloon		
Passooko	(*Head*, Kozohui; ⊙, Moomag)	Katchaykoo
Maploo	(*Head*, Kohuin; ⊙, Moo)	Kolanghoo
Play	(*Head*, Kohui, Pokochui; ⊙, Mooi, Moomag)	Kako, Laukoo
Hindu of Burma		
Rooinga	(*Head*, Mata; ⊙, Bel)	Kool
Rossawn, Arakan	(*Head*, Mustok; ⊙, Sooja)	Murtiha
Banga, or *Ayhoba*	(*Head*, Teekgo; ⊙, Bayllee)	Matee

4. The language of THIBET, or the Tangutish, has some words in common with the Chinese, but is less simple in its structure. It is at least as ancient as the religion of the country, which is nearly coeval with Christianity. Its character is well known to be alphabetical, from the title of the learned work of *Father Georgi* on the subject.

5. The *Indo-European* languages have been referred to a single class, because every one of them has too great a number of coincidences with some of the others to be considered as merely accidental, and many of them in terms relating to objects of such a nature that they must necessarily have been, in both of the languages compared, rather original than adoptive. The SANSCRIT, which is confessedly the parent language of India, may easily be shown to be intimately connected with the Greek, the Latin, and the German, although it is a great exaggeration to assert any thing like its complete identity with either of these languages. Thus, we find, within the compass of the Lord's Prayer only, *Pida*, *Pitir*, among the Sanscrit terms for *Father*, Gr. *Pater*; *Nama*, or *Namadheya*, for *Name*, Gr. *Onoma*, *Onomati*; *Radshiam*, *Kingdom*, Lat. *Regnum* from *Rego*; *Munasam*, *Will*, like the Greek *Menüo*, and the Latin *Mens*; *Stira*, *Earth*, Gr. *Era*, whence perhaps the Latin *Terra*; and *Danim*, or Devanagri *Dia*, Day, Lat. *Dies*. There are also some singular resemblances of declension and conjugation between the Sanscrit and the Greek, *Dodami*, *Dodasti*, *Dodati*; in old Greek, *Didomi*, *Didosi*, *Didoti*. In a tablet of the date 23 B. C. we find *Kritico* for a *Judge*, Gr. *Crites*, *Criticos*. In Mr Townsend's work we also find some well-selected instances of resemblance between the Sanscrit and other languages: thus, *Bhru*, is *Brow*; *Pota*, a *Boat*; *Bad*, a *Bath*, Germ. *Bad*; *Dhara*, *Terra*; *Nava*, *Novus*; *Nakta*, *Nocte*, *Night*; *Pad*, *Foot*, *Patte*; *Prathama* or *Protoma*, *first*, whence we deduce both the Greek *protos* and the Latin *primus*; and *Upadesaca*, *Didasco*, *Doceo*, and *Disco*. We have also *Vayajan*, *wind*, in Russian, *Vieyanie*; and *Vidhava*, *widow*, Latin, *Vidua*, German, *Wittwe*, Russian, *Vdova*. The NT of the plural verb is found in the Sanscrit *Bhavanti*, *they are*, *Dadanti*, *they give*. Sir William Jones and many others have attributed to some of the works which are still extant in Sanscrit an antiquity of four or five thousand years; but Professor Adelung denies the validity of any of the arguments which have been adduced in favour of a date at all approaching to this.

The Sanscrit, even in its earliest state, can scarcely have been altogether uniform throughout all the countries in which it was spoken, and it has degenerated by degrees into a great diversity of modern dialects: the term signifies learned or polished. Beyond the Ganges, it is called *Bali* or *Magudha*, which, the missionaries say, "scarcely" differs from Sanscrit; the term Magudha is said to mean mixed or irregular. In Siam the Sanscrit is still the language of elegant literature; and it is often employed throughout India, with some little difference of construction, under the name of *Devanagari*, the divine language. The *Prakrit* is rather a vague term, meaning, according to Mr Colebrooke, common or vulgar; but it is also applied to the language of the sacred books of the "Jainas." We find in a little publication, entitled a *Brief View of the Baptist Missions and Translations*, some useful information respecting the Indian languages and dialects, into a great number of which these laborious and disinterested persons have made or procured translations of the whole of the Scriptures, which they have printed at Serampore, near Calcutta. The dialects, which they enumerate, are principally arranged in a geographical order; and, beginning with those which are spoken towards the middle of India, as the pure *Sanscrit* and its least modified dialects, we may place next to them the languages of the countries bordering on the monosyllabic nations, towards the north and east: we have here the dialects of *Nepal*, *Assam* or *Uhumiya*, *Tiperah*, and *Kassai*, of which little more is known than that translations into the first two have been already executed: the *Bengalee* is spoken in and about Calcutta: the *Hindee* or *Hinduvee* is spoken about Agra; it is printed in the Devanagri character, the font of which contains more than 800 varieties of letters and their combinations; the *Urdu* or *Oordoo* is a subdialect of the Hindee, as well as the *Brijbassa*, which is nearer to the Sanscrit than some other dialects: the *Jypura* is mentioned as another language belonging to the same neighbourhood: the *Hindustanee* is spoken in Hindustan Proper, or Lower Hindustan; the missionaries say it is "*diametrically* different" from the Hindee: the *Moors* or "Mongol Indostanish" seems to belong to this country, being mixed with a good deal of Persian and Arabic, unless it be rather referrible to the Hindee: the dialects of *Udaipura*, *Benares*, and *Munipura*, are also called separate languages: the *Goandee* is spoken at Nagpore, in the Mahratta country: further east is *Orissa* or *Uriya*, the language of which is printed in a character requiring 300 different types: the *Telug* or *Warug* is spoken about Cuddalore and Madras: the *Telinga* further west: the *Carnatic* has a peculiar language, besides the *Tamul*, which is spoken from Paleacate, near Madras, to Cape Comorin, and the *Marwa*, which appears to belong to a part of this country. About Cochin in Travancore we have the *Maleiam*: further north, the languages of *Malabar*, *Kanara*, and of the *Decan*; the dialect of Malabar is of considerable antiquity, being found in two copper tablets as old as the eighth or ninth century: then comes the *Kunkuna*, about Bombay: the *Mahratta* is further inland: the *Guzurat* on the coast: and, beyond the Indus, the *Beloshee* in Belochistan: north of this we find the *Afghan* or *Pushtu* language, which contains more Hebrew words than any of its neighbours; the people are said to have come from the north about 2000 years ago, and, according to a Persian tradition, to be descended from King Saul; indeed the language stands somewhat more correctly under the Median family in the *Mithridates*, but since it forms the connecting link between the two families, it might perhaps be as conveniently arranged among the more numerous species of the Sanscrit; it is written in the Arabic character, with some additional letters for expressing the Sanscrit sounds. The language of *Multan*, north of Sindh, has about one tenth of Persian mixed with it. The *Gipsies* were certainly expelled from some part of India by the cruelties of Timur Leng, about the year 1400; and they were probably some of the *Zingans*, in the neighbourhood of Multan, their language having a great number of coincidences with that of Multan, and being still more manifestly a dialect of the Sanscrit, although they have adopted many European, and especially Sclavonian words. When they first appeared in Europe, they were supposed to amount to about half a million; at present they are less numerous.

The *Maldivian* is peculiar to the group of small islands from which it is named; the Baptists have already printed some books in it. The people are said greatly to resemble those of Ceylon. The *Cingalese*, which is spoken in great part of Ceylon, is a mixture of several of the continental dialects; and it has been observed, that the proper names in Ceylon mentioned by Ptolemy are of Sanscrit origin. Dr Leyden gives, as a proof of the antiquity of the *Malayan*, that the *Temala* of Ptolemy is derived from *Tema*, tin. The connection of this language with the Sanscrit has not been very universally admitted; and some of those who have studied it most are disposed to consider it as wholly original; but, in the purest part of the language, Dr Leyden confesses that there is a considerable resemblance to the Avanese and the Siamese; the words derived from the Sanscrit he considers as somewhat less numerous, amounting, however, to about 5000; they are generally less like the Bali than the Sanscrit; and a still smaller number are borrowed from the Arabic. The character of the monosyllabic languages is in some measure retained. Sir William Jones considered the Malayan as a derivative of the Sanscrit: Mr Marsden supposes it to have received its Sanscrit words through Gujerat; Dr Leyden rather from Kalinga or Telinga; and it exhibits some traces of the dialects of Tamul and Maleialam. Besides these various sources, it is said to have borrowed some of its simplest words from the Javanese and the Búgis; and it has become more nearly monosyllabic by dropping the first syllables of some of the words which it has adopted. The *Javanese* is said to be more ancient than the Malayan: the empire of Java was formerly powerful and flourishing: the ancient language was much like the Sanscrit, more so than the Malayan, but was written in a peculiar character. Dialects of this language are still spoken in Bali and in Madura. Leyden thinks the Malays were derived from Java; Marsden rather from Sumatra, though he allows that there are some reasons for conjecturing that an old Sanscrit colony may have settled many hundred years ago in Java, and mixed its language with a supposed mother tongue of that Asiatic race.

Of the *Sumatran* dialects, the principal, according to Dr Leyden, is the *Batta*, spoken by a people who occupy the centre of the island, and who still, like some other Indian nations, retain the custom of eating their old relations. The language seems to be partly original, and partly connected with the Malayan, and other dialects of the neighbouring islands. The *Rejang* is chiefly a mixture of Batta and Malayan; in the *Lampuhn* or Lampung there is also some Javanese. The *Achi* has admitted a still further influx of words belonging to all the Mussulman jargons of the neighbourhood, especially to that of the Mapulas of Malabar. There are other dialects of less note in Néas and the Poggy Islands, most resembling the Batta. This language is provided with a peculiar alphabet, which is remarkable for being written from the bottom of the paper upwards, like the Mexican hieroglyphics; though the Battas, as well as the Chinese, sometimes hold their books so as to read horizontally. In Borneo there appear to be several dialects, or rather separate languages; two of them, according to Dr Leyden, are the Biaju and the Tisun. The *Andaman* language is inserted here for want of a better place only; it does not appear to have any connection with the Sanscrit, and may possibly be found to be more like that of Madagascar: the people seem to belong to the Papuas, a distinct original race, according to Dr Leyden, black, and with woolly hair.

Besides the numerous translations into languages of the Indo-European class, the Baptist missionaries have also printed some Armenian and Persian works at the indefatigable press of Serampore, which is supplied by a letter-foundery and a paper-mill, belonging to the same establishment, enabling them to execute the whole business at less than half the expense of European books of the same magnitude. The little pamphlet already quoted contains also specimens of the characters of the Sanscrit, Assam, Bengalee, Mahratta, Sikh, and Cashmirian, which somewhat resemble each other in the square form of their characters; as well as of the Burman, Orissa, Telinga, and Cingalese, which have a more rounded and flourished appearance; of the Tamul, which looks a little like Armenian; of the Afghan and the Persian used in India; and of the Chinese, both as printed from blocks, and from the moveable metal types which have been cast at Serampore.

6. The connection of the MEDIAN family with the Sanscrit on one side, and with the Greek and German on the other, is sufficiently proved by the words *Abitap*, Zend. *Sun*, Sanscr. *Abitaba; Dar*, *Ter*, Pers. *Door*, Sanscr. *Dura*, *Tuwara*, Javanese, *Turi*, Gr. *Thüra*, Germ. *Thür*, *Thor; Dip*, Pers. *Land* or Island, Sanscr. *Dihp; Dochtar*, Pers. *Pothré*, Zend. *Daughter*, Gr. *Thügater*, Germ. *Tochter*, Sanscr. *Putri; Jaré*, Zend. *Year*, Sanscr. *Jahran*, Germ. *Jahr;* and *Ishk*, Zend. *Love*, Sanscr. *Itsha*. To this list we may add, from Dr Leyden, *Stree*, Zend. *Woman*, Sanscr. *Stri; Asté*, Zend. *He is*, Sanscr. *Asti*, Gr. *Esti; Hapté*, Zend. *Seven*, Sanscr. *Saptah*, Gr. *Hepta*. There are also some coincidences with the Chaldee, but the Median is certainly not a dialect of the Chaldee. Sir W. Jones and others have said that the Zendish was nearest to the Sanscrit, and the Pehlvi to the Chaldee or Arabic. In ancient Media, the *Zendish* was the language of the northern, and the *Pehlvi*, or *Parthian*, of the southern parts; the word Pehlvi or Pahalevi is supposed by Leyden to have been nearly synonymous with Pali or Bali, though this is said to be derived from Bahlika, an Indo-European country. The Zendish was more particularly appropriated to religious purposes, and the Pehlvi had in a great measure superseded it for common use at a very early period; under the Sassanides, again, from the third to the seventh century, the use of the Pehlvi was discouraged, and the old Persian substituted for it. It is said, however, that in the remote parts of the country, about Shirwan, some traces of the Pehlvi may still be found in existence. The *Zendavesta* of Zoroaster, which is still extant in Zendish, is said to have been written 520 years B. C.; and Adelung follows Anquetil in asserting its authenticity, even in opposition to the opinion of Jones and Richardson. These languages have little or no connection with the Georgian and Armenian, which have succeeded them in some of the same countries. The old Persian, which seems to be much connected with the Pehlvi, has remained in use, either as a living or as a learned language, ever since the time of the Sassanides; it was current among the Persians when they were conquered by the Arabs in the seventh century; and it is the language of the *Shah Nameh* of Firdusi, written in the tenth century, as well as of the *Ayeen Akbery*, of which the date is about 1600. The modern *Persian* became a cultivated language about the year 1000, having received a considerable mixture of Arabic and Turkish words. The term *Parsee* is commonly applied to a corrupt Pehlvi, spoken by the refugee fire-worshippers in Bombay.

The Goths are said to have inhabited, for some centuries, the countries about the Black Sea, and may originally have bordered on Persia. From this circumstance, and probably also from the effects of a later irruption of the Goths into Persia, which is recorded in history, we may easily explain the occurrence of many Persian words in German, and in the other languages of Northern Europe. Professor Adelung has examined more than two hundred cases of such resemblances, and has found only one sixth part of them in Anquetil's vocabularies of the more ancient dialects. He has, however, omitted to state what proportion the whole magnitude of these vocabularies bears to that of a complete dictionary of the language. It is well known that an essay was published a few years since in London, *On the Similarity of the Persian and English Languages;* and a more elaborate work on the relations of the Persian languages, by Mr le Pileur, has since appeared in Holland. Mr le Pileur attempts to explain the IS or S of the genitive of the northern languages, by the Persian preposition EZ, which seems to be synonymous with the Greek and Latin EX; but he has not shown that this EZ ever follows the noun to which it relates.

The *Kurds* speak a corrupt dialect of the Persian; they are probably derived from the Carduchi of the Greeks, who inhabited the Gordiæan Hills. They spread into Persia about the year 1000, and are now situated on the borders of the Persian and Turkish dominions. The language of the *Afghans,* about Candahar, is said to contain about one fourth of Persian, and some Tartarian, besides the Sanscrit which abounds in it.

7. The ARABIAN family is called by the German critics *Semitic,* from Shem the son of Noah, as having been principally spoken by his descendants. Though not intimately connected with the European languages, it is well known to have afforded some words to the Greek and Latin; it has also some in common with the Sanscrit, though apparently fewer than either the Greek or the German. Thus we have *Acer,* Hebr. a *Husbandman, Ager,* Lat. a *Field; Asther,* a *Star,* Gr. *Aster, Bara, Buri,* Germ. *Burg; Ben,* Hebr. *Son,* Sanscr. *Bun, Child; Esh,* Hebr. *Eshta,* Chald. *Fire,* Sanscr. *Aster;* and *Ish,* Hebr. *Man,* Sanscr. *Isha, Man* or *Lord.* The Hebrew *Ani, Anoki, I,* has been noticed by Townsend and others as affording an etymology for *Ego* as well as for *Ni* or *Mi* of verbs, for the *Anok* of the Egyptians, and even for the *Ngo* of the Chinese.

The northern nations of this family have sometimes been comprehended under the name *Aramaic,* in contradistinction to the middle or Canaanitish, and the southern or Arabian. The Eastern Aramaic, or old *Chaldee,* is very little known; it was the language of a people situated in the north of Mesopotamia, which is now the south of Armenia; a part of them extended themselves further south, and became Babylonians, of whose dialect some traces are said still to exist about Mosul and Diarbeker. The old Assyrians, between the Tigris and Media, were a colony of the Babylonians, and spoke a language unintelligible to the Jews (2 Kings, xviii). The Western Aramaic has become known, since the Christian era, as the *Syriac,* in which there is an ancient and valuable translation of the *New Testament.* It is still spoken about Edessa and Harran. The Palmyrene was one of its dialects; the modern *Assyrian* of the Russian vocabularies appears to be another.

The language of the Canaanites is said by St Jerome to have been intermediate between the Hebrew and the Egyptian. The people are supposed to have come originally from the Persian Gulf; the Philistines, who were found among them, to have emigrated from the Delta to Cyprus, to have been thence expelled by the Phœnicians, and to have adopted the language of the Canaanites when they settled among them. The book of Job is considered as affording some idea of the dialect of Edom; it is well known to contain many Arabisms, besides some other peculiarities. The *Phœnician* is only known from a few coins and inscriptions found chiefly in Cyprus and in Malta, and not yet very satisfactorily deciphered, though Akerblad is convinced, by some of them, that it varied but very little from the Hebrew; of its descendant, the *Punic,* or Carthaginian, a specimen is preserved in the speech of Hanno in Plautus, as happily arranged by Bochart; the objection of Adelung, respecting the want of a proper name, appearing to have arisen from a mistake. The last six lines of the text are probably either a repetition of the same speech in the old Libyan of the neighbourhood, or a jargon intended to imitate it.

The *Hebrews* originated among the Chaldeans, Terah, the father of Abraham, having been a native of Ur, or Edessa, beyond the Euphrates. They adopted the language of the Canaanites, among whom they led a nomadic life, till their residence in Egypt, which must probably have had some effect in modifying their language. After that time, however, it appears to have varied but little, in a period of 1000 years, from Moses to Malachi; and this circumstance Adelung considers as so uncommon and improbable, that he is disposed to believe that the writings of Moses must have been modernized at least as late as the time of Samuel. The old Hebrew became extinct, as a living language, about 500 B. C.; 1000 years afterwards, the Masoretic points were added, to assist in its pronunciation; and this was done in some measure upon the model of the Syro-Chaldaic, which at that time was still spoken. The Septuagint version, which is much older, supports, in the instances of many of the proper names, the reading indicated by the points; but in about as many others it appears to deviate from that system, and to agree with a mode of pronunciation founded upon the text or principal characters alone. The reading in Greek letters of Origen, in his *Hexapla,* tends, on the whole, very strongly to support the points. The *Chaldee* had superseded the Hebrew at the time of the captivity, and was gradually converted into the *Syro-Chaldaic,* which is called Hebrew in the New Testament. The Targums, and the Talmud of Babylon, are in the older Chaldee; and a Syro-Chaldaic translation of the New Testament has been discovered to be still in existence.

The *Samaritan* somewhat resembles the Chaldee. It was formed among the Phœnicians and others, who occupied the habitations of the ten tribes when they were carried into captivity by Salmanassar and Esarhaddon. Its peculiar alphabet is well known as a mere variation of the Hebrew.

The *Rabbinical* dialect was principally formed in the middle ages, among the Spanish Jews, who were chiefly descended from the inhabitants of Jerusalem; while those of Germany and Poland were generally Galileans, and spoke a ruder dialect of the Hebrew than the fugitives from the metropolis.

The *Arabs* have been a distinct, and in a great measure an independent nation, for more than 3000 years. Some of them were descended from Shem; others, as the Cushites, Canaanites, and Amalekites, from his brother Ham. Their language, as it is found in the Koran, contains some mixture of Indian, Persian, and Abyssinian words. Its grammar was little cultivated until a century or two after the time of Mahommed. It is certainly copious, but its copiousness has been ridiculously exaggerated and absurdly admired. The best Arabic is spoken by the upper classes in Yemen; in Mecca it is more mixed; in Syria corrupt, and still more so in some parts of Africa. There are dialects which require the assistance of an interpreter to make them intelligible; at the same time, it has been maintained by Aryda, a learned Arab of Syria, in contradiction to Niebuhr, that the Arabic of the Koran is still employed in conversation among the best educated of the people, as well as in correct writing. The Arabs living in houses are called Moors, and those of Africa are the best known under this name. The Mapuls or Mapulets of Malabar and Coromandel are a numerous colony of Arabs, who have been settled there above a thousand years.

The *Ethiopians* are descended from the Cushite Arabs. In the time of Nimrod they conquered Babylon; before that of Moses they emigrated into Africa, and settled in and about Tigri; in Isaiah's time they seem to have extended to Fez; and at present they occupy Tigri, Amhara, and some neighbouring countries. They became Christians in 325, but retained the initiatory ceremony of the Jews and Mussulmen. The pure or literary Ethiopic is called *Geez*, or Axumitic, in contradistinction to the Amharic, by which it was superseded as the language of common life in Amhara about the fourteenth century, although it is still spoken, without much alteration, in some parts of *Tigri*, while in others, as in *Hauasa*, a different dialect is spoken. The Ethiopic was first particularly made known in Europe by the elaborate publications of Ludolf. Mr Asselin has lately procured a translation of the whole of the Bible into the Amharic, as it is now spoken at Gondar; it was executed by the old Abyssinian traveller who was known to Bruce and to Sir William Jones, and it is said to be now printing at the expense of some of the British societies.

The *Maltese* is immediately derived from the modern Arabic, without any intervention of the Punic. The island, having been successively subject to the Phæacians, Phœnicians, Greeks, Carthaginians, Romans, and Goths, was subdued by the Arabians in the ninth century; in the eleventh the Normans conquered it; and it remained united with Sicily until it became in some measure independent, under the knights of St John.

8. The LYCIAN is only known from a few short inscriptions copied by Mr R. Cockerell, and published in Mr Walpole's collection, together with two or three longer ones, which have been lately brought from Antiphellos by the enterprising and indefatigable Mr W. J. Bankes. By means of a proper name in one of Mr Cockerell's inscriptions, we obtain a part of the alphabet; thus î is A; Δ, D; E, I; P, R; Ƽ, S; and probably Λ, H; and I, L. A further comparison of the different parts of the other inscriptions with the Greek phrases that almost uniformly accompany them, implying "FOR HIMSELF AND HIS WIFE AND HIS CHILDREN," gives us the words A, or AT'HI, *himself*; SA, *his*, or *for his*, HRDI, or perhaps HROI, *wife*; TIDAIMI, *son*; TIDAIMA, *children*; and ATBI, *and*. It does not appear that any of these words would authorize us to place the Lycian language as a member of the great Indo-European class; but it is reported to have been much mixed with Greek, and, on account of its geographical situation, it may be allowed to occupy a temporary rank between the principal oriental and European languages. If it has a shadow of likeness to any other language, it is perhaps to the Cimbric; and *Tidaimi* may also possibly be allied to the Greek *Titheno*, to nurse.

9. Respecting the ancient PHRYGIAN, we have a few traditions only, which at least agree in giving it a high antiquity, as the source of several Greek words. Thus, Plato observes, in his *Cratylus*, that the terms denoting *fire* and *water* are not derived from any other Greek words, but are Phrygian primitives. It seems, however, that *water* was called *Bedü* by the Phrygians, and the word resembles the *Bada*, *Bath*, of the northern nations, as well as the *Vate*, water, of the Swedes; *Moirai*, the fates, derived from the Phrygian, is compared to *Meyar*, virgins, of the Gothic; and *Bek*, *bread*, is as much like our *Bake*, as like the Albanian *Buk*, *bread*.

The *Greek* has no very intimate or general connection with any of the older languages which have been preserved entire, although there are a number of particular instances of its resemblance to the Sanscrit, some of which have been already mentioned; it has also many German and Celtic words, some Sclavonian, and, as it is said, a few Finnish. It can only have been immediately derived from the language of the neighbouring Thracians and Pelasgians, who seem to have come originally from the middle of Asia, through the countries north of the Black Sea, and to have occupied not only Greece and Thrace, but also the neighbouring parts of Asia Minor, where they probably retained their ancient dialect to a later period than elsewhere. The whole of the Thracian states were greatly deranged by the expedition of the Celts in 278 B. C. which terminated in their settling the colony of Galatia. The Dacians, or Getæ, who principally occupied Bulgaria, extended themselves further northwards, and afterwards constituted the Roman provinces of Mœsia and Dacia, which were conquered by the Goths in the third century. The Macedonians, in the time of Alexander, spoke a language which was nearly unintelligible to the Greeks in general; even the Pelasgi in Epirus and Thessaly long retained a dialect materially different from their neighbours, and in Arcadia still longer. The Hellenes, who emigrated from Asia Minor into Greece, were not sufficiently numerous to carry their own dialect with them, although the language assumed their name. The Græci in Italy were Pelasgians, although Dionysius of Halicarnassus includes them in the denomination Hellenic; their language must have been Æolo-Doric, and it was in this form that the Latin received its mixture of Greek; the Lacedemonian also retained it till a late period, writing, for instance, instead of *Pais*, *Poir*, as in Latin *Puer*. The *Æolic* appears once to have extended over Attica, and to have left some Æolisms in the old Attic dialect. This dialect was the principal basis of the common language of Greece at a later period, which must have been the most cultivated under the protection of the court of Alexandria, and which continued to be spoken and written in the highest circles of Constantinople throughout the middle ages. By degrees it degenerated into the modern *Romaic*, having received a mixture of Turkish and Italian, and perhaps of some other neighbouring languages.

11. The GERMAN family is sufficiently connected with a variety of others belonging to the Indo-European class, to be admitted into it upon a very short investigation. Its resemblances to the Greek, within the compass of the Lord's Prayer, besides *Father* and *Name*, are *Wille*, *Wollen*, Gr. *Boule*, perhaps *Brot* or *Proat*, *bread*, like *Artos*, and *Freyen* or *Lösen*, like *Rhüein* and *Lüsein*. Dr Jamieson has shown very clearly, in his *Hermes Scythicus*, how immediately the structure of the Gothic languages is derived from that of the Greeks. Thus the EIN of the Greek infinitive became in the Mœso-Gothic *an* or IAN, in German EN: the ICOS of the adjectives, Mœso-Gothic, AGS, IGS, or EIGS, as *mahteigs*, *mighty*, Germ. *machtig*; the Sclavonians have *ski*, the Swedes *ska*: the INOS, Lat. ENUS, Anglo-Saxon EN: the LICOS, Latin LIS, German LICH, English LIKE; thus *pelicos* is *what like*, at least in Scotland; the Mœso-Gothic *swaleiks* is our *such*; *sameleiks* is *similis*. LOS, LIS, LION, of diminutives, in Latin LUS, becomes in Mœso-Gothic ILO, as *barnilo*, a little child; in German *mannl* is a little man. Among the pronouns we have EGO in Greek and Latin, Mœso-Gothic IK, Icelandic EG, Swedish JAG; EMOU, MOU, Gr., Latin MEI, Mœso-Gothic MEINA, German MEINER; EMOI, MOI, Latin MIHI, Mœso-Gothic MIS, Swedish MIG, Dutch MY; EME, ME, Latin ME, Mœso-Gothic MIK, Anglo-Saxon ME, Dutch MY. Sü, Doric Tü, Latin TU, Mœso-Gothic THU. Is in Latin, Mœso-Gothic IS; EJUS, Mœso-Gothic IS, IZOS; ID, Mœso-Gothic ITA, English IT; QUIS, CUJUS, CUI, QUEM, Mœso-Gothic QUHAS, QUHIS, QUHE, QUHANA, the last having the N, as the Greek HON; UTER, WHETHER; ALTER, OTHER, seems to be derived from ANTHER, ENTHERA, meaning *one of them*, so that in this instance the Gothic has the appearance of the greater antiquity, while the Greek affords, on the other hand, an etymology for EKEINOS, from EKEI, *there*, which is wanting to the Mœso-Gothic GAINS or JAINS, the Alemannic GENER, the German JENER, and the English YON-

DER OR YON. Again, among the numerals, DEKA has been derived from DEO, as if both hands were tied together; and PENTE has a strong resemblance to PANTA, as if *all* the five fingers were reckoned: and, on the other hand, *da cuig* in Gaelic, meaning twice five, has been considered as the original of DECA. But none of these etymologies seems to be so decisive of originality as that of *caterva*, which is evidently related to *turba* or *turma*, while the first syllable remains unexplained in Latin; but in the Celtic we have *cad tarf*, or *cath tarf*, a *war troop*, agreeing undeniably with the sense. For another example, we may take *ventus* and *wind*, for which we find no Latin etymology, while the German furnishes us with *wehen*, to *blow*, and thence *wehend* and *wind;* the words *nodus* and *knot* afford also a similar instance, *nodus* having nothing nearer to it in Latin than *neo*, to spin, *necto*, to unite; but in German we have *knütten*, to join, and in English *knit* and *knead* from the same root. The degrees of comparison are expressed in Greek by EROS and ISTOS; in Anglo-Saxon by ER or ERA, and IST or AST. *Er* seems to mean *before*, as well as the Latin OR. The Coptic has no comparative, but for *better than I*, the Egyptians said *very good before me.* It would seem at first sight natural to make *than* a preposition, as well as *before*, and to say *better than me;* but the fact is, that in English, as well as in German, it was usual of old to say *then* or *denn* in this sense; and *he is wiser than I* meant only, *he is wise* BEFORE, THEN *I follow.* The idea of time or place is now dropped as unessential to the kind of priority in question, but the ground of the grammatical construction remains unaltered. In Mœso-Gothic the comparative termination is IZO or OZO, the superlative ISTS or ISTA; thus the Greek MEIZON becomes MEIZO, and MAISTS is obviously MEGISTOS. The old *megalos* is *mikils*, mickle or muckle; and *minor*, *minimus*, became *minnizo*, *minnists;* in Persian, *mih* is *great*, *mihter*, *greater*, *mihtras*, *greatest; better* seems to be from the old German *bied* or *bieder*, *upright*, *honest*, and resembles the Persian BIHTER, *better.* The Mœso-Gothic verbs have also some striking resemblances in their form to the Latin; thus the present tense of *to have* is HABA, HABAIS, HABAITH; HABAM, HABAITH, HABAND; HABUIT is HABAIDA; HABENS, HABANDS; HABENTIS, HABANDIS; HABENTEM, HABANDAM; HABENTES, HABANDANS. The substantive verb singular in Greek is EIMI, EIS, ESTI; the plural in Latin SUMUS, ESTIS, SUNT; the Mœso-Gothic has IM, IS, IST, SIJUM, SIJUTH, SIND; and SIS is SIJAIS; ESSE, WISAN. The Mœso-Gothic nouns frequently retain the resemblance of the Greek more strongly than their more modern derivatives: thus a TOOTH does not seem to point very immediately to DENTEM or ODONTA as its source; but the older form TUNTHU is clearly the intermediate stage of this modification; and numberless other instances of the same kind might easily be found.

The Germans were known, as early as the time of Pytheas, that is, 320 B. C. as consisting of the Jutes in Denmark, the Teutones on the coast to the east of them, the Ostiæans next, and lastly the Cossini, Cotini, or Goths. Professor Adelung imagines that the eastern nations, or Suevi, employed almost from the earliest times a high German dialect, and the western, or Cimbri, a low German; the Suevi he supposes to have been driven, at a remote period, into the south of Germany by the Sclavonians; and some of the Goths appear to have extended as far as the Crimea. The *Bible* of Ulphila, in the Gothic or Mœso-Gothic of 360, is the oldest specimen in existence of the German language. Besides the Greek and Latin, which appear to prevail so much in the language, it exhibits a considerable mixture of Sclavonian and Finnish; the translation is far more literal than it could be made in any of the more modern dialects of the German, and sometimes appears to follow the text with somewhat too much servility.

The modern *German*, founded on the higher dialects of Saxony, was fixed and made general by Martin Luther. There are many shades of dialect and pronunciation in the different parts of this diversified country, but none of them of any particular interest, or established by any literary authority. There are still some German colonies in the territories of Vicenza and Verona, called the Sette Comuni, which retain their language. The German Jews have a peculiar jargon, borrowed in some measure from their brethren in Poland, which they write in Hebrew characters; and another similar mixture of discordant dialects is spoken by the Rothwelsh, a vagabond people in the south of Germany, who have sometimes been confounded with the Gipsies.

The *Low Saxon*, or Platt Deutsch, is spoken about Halberstadt, and farther north, in the countries between the Elbe and the Weser; it seems to be intimately connected with the Frieslandish and Danish, as well as with the English. The *Frieslanders* originally extended from the Rhine to the Ems, and the Cauchi, thence to the Elbe; these countries still retain a dialect materially varying from those of their neighbours. The Brokmic laws of the thirteenth century exhibit some remarkable differences from the German of the same date: thus we find in them *Redieva*, a judge, or *Reeve*, instead of *Richter; Kenne*, *kin;* and *sida*, *side*, as in Swedish, instead of *seite*. The Batavian Frieslandish approaches very much to the English; it has several subdialects, as those of *Molkwer* and *Hindelop*. Some of the Cauchish Frieslanders remain in the territory of Bremen; the North Frieslanders occupy Heligoland, Husum, and Amröm.

The *Dutch* language is a mixture of Frieslandish, Low Saxon, and German, with a little French. It appears, from Kolyn's *Chronicle*, to have been distinctly formed as early as 1156.

The Scandinavian branch of the Germanic family is characterized by the want both of gutturals and of aspirates, which renders its pronunciation softer and less harsh; and by some peculiarities of construction, for instance, by the place of the article, which follows its noun, both in *Danish* and Swedish, instead of preceding it, as in most other languages. The name of Denmark is first found in the ninth century; until the sixth the people were called Jutes. *Norway*, in the ninth century, was termed Nordmanland. A corrupt Norwegian is still, or was lately, spoken in some of the *Orkneys*, which were long subject to Norway and Denmark. In the eastern parts of *Iceland*, the language is much like the Norwegian; but, on the coast, it is mixed with Danish. The oldest specimen of Icelandic is the *Jus Ecclesiasticum* of 1123. The term Runic relates to the rectilinear characters cut in wood, which were sometimes used by the Scandinavian nations. The *Swedes* are derived from a mixture of Scandinavians with Goths from Upper Germany, but their language does not exhibit any dialectic differences corresponding to this difference of extraction. Mr Townsend has given us a list, from Peringskiold, of 670 Swedish words resembling the Greek; but it must be confessed that the resemblance is in many cases extremely slight.

The *Saxons* are mentioned by Ptolemy as a small nation in Holstein, whence, in conjunction with the Frieslanders, and the Angles of south Jutland, they came over to England, about the year 450. The Saxons settled principally south of the Thames, the Angles north. At the union of the Heptarchy, the Saxon dialect prevailed, and the Anglish, which nearly resembled the Danish of that time, was less in use; but new swarms of Danes having inundated the north of England in 787, the Danish dialect was introduced by Canute and his followers; and it is about this period that our earliest specimens of the

Anglo-Saxon are dated. The Saxon dialect again obtained the ascendancy under Edward the Confessor; and although some French was introduced by this prince, and still more by William the Conqueror, into the higher circles of society, the courts of law, and the schools, yet the use of the French language never became general among the lower classes, and the Saxon recovered much of its currency in the thirteenth century, when the cities and corporate towns rose into importance, under Edward the First. In the fourteenth century it was permanently established, with the modifications which it had received from the French; and it may be considered as truly English from this period, or even somewhat earlier, at least if Pope Adrian's rhymes are the genuine production of 1156. It is still much more German than French; in the Lord's Prayer, the only words of Latin origin are *Trespass*, *Temptation*, and *Deliver*. Professor Adelung's remarks on the simplicity of the English language appear to be so judicious as to deserve transcribing. "The language," he observes, "only received its final cultivation at the time of the Reformation, and of the civil disturbances which followed that event; nor did it acquire its last polish till after the Revolution, when the authors who employed it elevated it to that high degree of excellence, of which, from its great copiousness, and the remarkable simplicity of its construction, it was peculiarly capable. It is the most simple of all the European languages; the terminations of its substantives being only changed in the genitive and in the plural, and the alterations of the roots of the verbs not exceeding six or seven. This simplicity depends in some measure on a philosophical accuracy, which is carried systematically through the whole language, so that the adjectives, participles, and article, are indeclinable, being in their nature destitute of any idea of gender, case, or number; and the form of generic distinction is [almost entirely] confined to objects which are naturally entitled to it. The pronunciation, on the other hand, is extremely intricate; and foreign proper names, in particular, are much mutilated whenever they are adopted by the English."

12. The CELTIC family forms a very extensive and very interesting subdivision of the Indo-European class. It has been asserted by some writers, "that the six original European languages, the Iberian, Celtic, Germanic, Thracian, Sclavonian, and Finnish, were just as distinct at the beginning of their history as they now are;" but this assertion must be subjected to considerable modification. The thing is in itself so improbable, as to require far more evidence than we possess to establish it, even if that evidence were of a more decisive nature; and, in fact, it will actually be found, upon a comparison of the Gothic of Ulphila with the more modern dialects, that the Germanic of that day did approach more nearly, both to the Celtic and to the Thracian or Greek, than any of its more modern descendants do. The change of TUNTHU into TOOTH, for which the Germans have ZAHN, has already been noticed; the ATTA and HIMINA of Ulphila seem to be more like the Irish At'air and Neamh, than the modern Vater and Himmel are; and the Mœso-Gothic VAIR, which answers to the Cimbric FEAR, a man, is not at present found in German, though its traces may still be observed in the *Firiobarno* of the Franks in 1020; the antiquity of the root is shown by the Celtic names in Cæsar beginning so often with VER, and still more strongly by the testimony of Herodotus, that the Scythian called a man AIOR. At the same time, therefore, that we admit the propriety of considering the Celtic and Germanic as families clearly distinct, with respect to any period with which we are historically acquainted, we must not forget that they exhibit undeniable traces of having been more intimately connected with each other, and with their neighbours, in the earlier stages of their existence. The resemblances of the Celtic to the Latin are too numerous to require particular notice, the immediate and extensive connection between these languages being universally admitted; but if any evidence were desired on this subject, it might be obtained in abundance, by a reference to Court de Gebelin's *Monde Primitif.* With respect to the Greek, the terms *Hael*, sun; *Dur*, water; *Deru*, oak; *Garan*, crane; *Crunn*, ice, are among the Celtic words of the most indisputable originality; and their resemblance to *Helios*, *Hüdor*, *Drüs*, *Geranos*, and *Crüoen*, is equally undeniable. We find, also, in the Cimbric, *Bas*, low, connected with *Bathüs*, *Bara*, bread, perhaps with *Bora*, food; *Deyrnas*, kingdom, with *Türannis; Dyro*, give, with *Doreue;* and *Gogoriant*, glory, perhaps with *Gauriaon*, exulting. With the German it is easy to find a number of very near approaches to identity, even in that Celtic which can be proved, principally from the etymologies of proper names, to be prior to the date of any known or supposed secondary intercourse or mixture of the natives concerned. Thus we have, either accurately or very nearly in the same signification, *Ap, Affe*, or *Ape; Barra, Barre; Bleun, Blume; Bolgan, Balge; Brig, Berg; Brogil, Brühl; Carra, Karre; Doga, Teich; Galb, Klab; Garan, Kranich; Gnabat, Knabe; Lancea, Lanze; Marc, Mähre; Marga, Märgel; Redya, Reiten; Rit* or *Rat, Rad;* and *Ur, Auer;* and it is impossible to suppose that so numerous a series of coincidences can have been derived from accidental causes only.

The Celts may be imagined to have emigrated from Asia after the Iberians or Cantabrians, and before the Thracians or Pelasgians, settling principally in Gaul, and spreading partly into Italy, under the name of Ausonians and Umbrians. In 570 B. C. they undertook expeditions for the purposes of conquest, but they were subdued by the Romans. Their language was current in Gaul till the sixth or seventh century, when it was superseded by the rustic Roman, which by degrees became French; in Ireland and Scotland it has remained with few alterations; in Wales and Brittany it has been more mixed. The Gauls must have peopled Britain at least as early as 500 B. C. The true ancient Britons are the Highlanders of Scotland only, having been driven northwards by the Cimbri: they still call their language Gaelic. The Irish are probably derived from these Highlanders; they were originally termed Scots or Scuits, that is, fugitives, from the circumstance of their expulsion from Britain; so that, where the Scots are mentioned before the tenth century, as by Porphyry in the third, we are to understand the Irish. Gildas, in 564, sometimes calls them Scotch and sometimes Irish. After the retreat of the Romans from Britain, a part of them re-entered Scotland about the year 503, and changed its name from Caledonia to Scotia Minor. In 432 St Patrick laid the foundation of the civilization of Ireland; and, in the seventh century, several Irish priests undertook missions to the continent. At the beginning of this century, some Scandinavian freebooters had begun to visit Ireland; and, in the year 835, they formed large colonies of emigrants, who established themselves firmly in that country, and in the Scottish islands, bringing with them many Gothic words, which became afterwards mixed with the Celtic, and which seem to constitute about one fifth part of the modern Irish and Gaelic, 140 Gothic words being found under the first six letters of the alphabet only. Some of these Normen remained distinct from the Irish till the year 1102. The oldest specimens of the Irish language, admitted by the continental critics to be authentic, are of the ninth century; though some of our antiquaries have imagined they have discovered records of a much earlier date. The Gaelic of the Isle of Man, is mixed with Norwegian, English, and Welsh. A Gaelic colony formerly established at Walden, in Essex, has been placed by Chamberlayne in Italy, as a nation of *Waldenses*.

The *Cimbric* or Celto-Germanic language was remarked by Cæsar as differing from the Gallic, although the distinction has not always been sufficiently observed. The Cimbrians seem to have existed as a nation 500 or 600 years B. C.; the Gauls called them Belgæ; the invaded Britain a little before Cæsar's time, and drove the ancient inhabitants into the Highlands and into Ireland. Having called the Saxons to their assistance against the Scots and Picts in the fifth century, they were driven by their new allies into Wales, Cornwall, and Brittany. Their language is remarkable for the frequent changes of the initial letters of its radical words in the formation of cases and numbers; thus, from *Den*, a man, in *Britannish*, is derived the plural *Tud;* from *Vreg*, a woman, *Groages*. Almost half of the Welsh language seems to be German, and half of the remainder is perhaps Latin or Celtic; of the Britannic, about half resembles the Latin or French. Brittany was originally inhabited by the Armoricans; whether they were properly Belgæ or Gauls is uncertain. The country was named Britannia Minor, from the emigration of the British in 449; these new comers mixed with the original inhabitants, all speaking the same language, and in a few years became so numerous, as to be able to send an army of 12,000 men to the assistance of the Emperor Anthemius.

Professor Adelung is disposed to consider the German portion of the different branches of the Celtic, which varies from one fifth to one half of the whole language, as an accidental mixture, and derived through different channels. But we cannot in all cases find any historical evidence of the existence of these channels; it is difficult, for example, to suppose that the Scandinavian incursions were able at any early period to influence the language of the Highlands of Scotland; and wherever it happens, as it frequently does, that no term is to be found, in the Irish, the Gaelic, or the Welsh, for expressing the same idea, besides the word that they all have in common with the German, it is scarcely possible to believe that there ever was any other Celtic word, which has been so uniformly superseded by independent causes. We find, for instance, under the two first letters of the alphabet only, the words *Ap* or *Apa* in Irish, *Ap* in Welsh, *Affe* or *Ape* in Gothic; again, *Abal, Afal, Apfel; Angar, Aneang, Enge; Bacail, Bach, Backen; Barrad, Barr, Bare; Beoir, Bir, Bier; Biail, Bwiall, Beil; Bocan, Bwch, Bock; Brathair, Brawd, Bruder; Bul, Bwla, Bulle;* and the same agreement is found in almost all other instances of German words that are detected in the Irish language.

The much-disputed question respecting the antiquity of the poems attributed to Ossian has an immediate reference to the history of the Celtic languages. It has been observed, with apparent justice, by Professor Adelung, who is not in general sceptical on such occasions, that if these poems were really very ancient, their language could not but exhibit marks of antiquity. There is an Irish *Leavre Lecan* at Paris, written in the thirteenth century, and scarcely intelligible to the best Irish scholars of the present day; the oldest Gaelic manuscripts have also peculiar expressions no longer in use; while the works supposed to be the productions of a period so much more remote are found to be in "excellent modern Gaelic, impressed with all the marks of the language of Christianity, and of that of the Norwegian invaders, whether these conquerors may be supposed to have influenced the Gaelic language immediately in Scotland, or by the intervention of Ireland." It must not, however, be forgotten, that these marks of Scandinavian intercourse are somewhat more ambiguous than Professor Adelung is disposed to admit; and that a book written in the thirteenth century is more likely to have preserved the language in an antiquated form than poems so marvellously committed to memory from continual recitation only, by people supposed to understand them, and of course imperceptibly modifying the expressions without intending to alter them. But since an invasion from Lochlin, that is, Denmark or Norway, is actually mentioned in "Fingal," the author of the poem could certainly not have been older than the seventh or eighth century, if we are to credit the historical accounts of these invasions; and since, in the poems discovered by Dr Matthew Young, St Patrick is introduced discoursing with Ossian respecting the Christian religion, we have an additional argument for denying that he was contemporary with Caracalla or Carausius, these emperors having both lived in the third century, and St Patrick in the fifth.

14. The ETRUSCAN is only known as the immediate parent of the Latin; but it was written in a character totally different, and was read from right to left. Notwithstanding the industry and ingenuity of Lanzi, the evidence of the accuracy of his interpretations is somewhat imperfect. We should naturally have expected to find more words of a Celtic or Gothic origin, and not merely Greek or Latin words with the terminations a little varied, as *Ustite* for *Ustura, Tribo* for *Tribus*, and *Urte* or *Urta* for *Heorte;* still less should we have expected that the same sense should be expressed sometimes by a Greek and sometimes by a Latin word, as *Urtu* and *Puni* for Bread, *Capros* and *Feres* for a Boar. The Etrurians and Umbrians were originally a branch of the Celts from Rhætia, as is shown by the similarity of the names of places in those countries, as well as by the remains of Etruscan art found in that part of the Tyrol; they are supposed to have entered Italy through Trent, about the year 1000 B. C., and to have afterwards improved their taste and workmanship under the auspices of Demaratus of Corinth, who settled in Etruria about 660 B. C. (See ETRURIA and ETRUSCANS.)

15. The LATIN language is placed at the head of a family, rather with regard to the number of its descendants than to the independence of its origin, being too evidently derived from the Celtic, mixed with Greek, to require particular comparison. The first inhabitants of Italy appear to have been Illyrians or Thracians, Cantabrians, Celts, Pelasgians, and Etrurians. Rome, from its situation, would naturally acquire much of the languages of these various nations, and at the same time much of the Greek from the colonies in the south of Italy. In the time of Cicero, the Italian songs, supposed to be about 500 years old, were no longer intelligible, even to those who sang them. We find, in an inscription still more ancient, and approaching to the time of Romulus, *Lases* for *Lares;* and for *Flores, Pleores*, which is somewhat nearer to the Celtic *Bleun*. In the time of Numa, for *Hominem liberum*, we have *Hemonem lœbesom;* we find, also, a D added to the oblique cases, as *Capited* for *Capite*, which, as well as the termination AI, in the genitive *aulai, pennai*, is taken immediately from the Celtic, and is even found in modern Gaelic.

The Latin remained in perfection but a few centuries. In the middle ages, a number of barbarous words were added to it, principally of Celtic origin, which are found in the glossaries of Dufresne and Charpentier. At the end of the seventh century it began to acquire the character of *Italian*, as *Campo divisum est;* and, in the eighth century, in Spain, we find, as an example of its incipient conversion into Spanish, *Vendant sine pecho, de nostras terras*. The formation of the Italian language may be said to have been completed by Dante, in the beginning of the fourteenth century; and it was still further polished by the classical authors who immediately succeeded him. It contains many German words, derived from the different nations who occupied in succession the northern parts of Italy, and some Arabic, Norman, and Spanish, left by occasional visitors in the south. It is spoken by the common people in very different degrees of purity. Among the northern dialects, that of *Friuli* is mixed with French, and with some Sclavonian. The *Sicilians*, having been conquered in succession by the Greeks, Carthaginians, Romans, Byzantines, Arabs, Normans, Germans, French, and Spaniards, have retained something of the language of each. *Sardinia* has given shelter to Iberians, Libyans, Tyrrhenes, Greeks, Carthaginians, Romans, Vandals, Byzantines, Goths, Lombards, Franks, Arabs, Pisans, and Aragonians; and the proper Sardinian language is a mixture of Latin with Greek, French, German, and Castilian. Corsica has also been occupied by a similar diversity of nations; its peculiar idiom is little known, but the dialect of the upper classes is said to approach nearly to the Tuscan.

Spain, after its complete subjugation by the Romans, enjoyed some centuries of tranquillity. The Vandals and Alans retained their power in Spain but for a short time; the Suevi, on the north coast, somewhat longer; and from these nations the rustic Roman, which had become general in Spain, received some words of German origin. It derived, however, much more from the Arabic during the domination of the Moors, which lasted from the beginning of the eighth century to the end of the fifteenth; and, at one time, the Arabic was almost universally employed throughout the country, except in the churches. The *Spanish* language advanced the most rapidly toward perfection during the height of the national prosperity, which immediately followed the conquest of America. It was afterwards neglected, and again more particularly cultivated by the Academy of Madrid, in the eighteenth century; as far at least as an academy can be supposed to have any influence in the modifications of a language.

The *Portuguese* is supposed to have received a mixture of French from the followers of Count Henry of Burgundy, under whom Portugal first formed a separate state in 1109; but the language is very different from that of the confines of France and Spain; and the nasal vowels, which are remarkable in the Portuguese, differ materially from those of the French, or of any other nation. Many Latin words are retained in the Portuguese which are not found in any other modern language; and it is remarkable that almost all the words of the language are contracted, by the omission of some of the radical letters of the originals.

The Rhætians, in the country of the Grisons, were subdued by the Romans in the time of Augustus. They became part of the Alemannish kingdom, under Theodobert, in 539; their union with Switzerland took place in the beginning of the fourteenth century. Half of the Grisons speak the *Romanish* language, immediately derived from the Latin, though mixed with some German, which has been particularly made known by Mr Planta's account of it in the *Philosophical Transactions.* One third speak German, with some mixture of Romanish words, and the rest a bad Italian.

France, in the time of the Romans, was occupied by the Gauls, together with the Aquitanians, who were probably Cantabrians, and the Cimbrians or Belgians. From the rustic Roman, mixed with the languages of these nations, the *Romance* was gradually formed. In the fifth century, the Franks took possession of the north-eastern part of the country. They retained their language for some centuries, but by degrees it became mixed with the Romance, and formed *French*, of which at least one fifth is supposed to be of German origin, though many of the German words seem to have been admitted through the medium of the Italian. In the south of France, the language remained more exempt from the influence of the German, under the name of the *Provençal;* and the troubadours contributed, especially from the eleventh to the thirteenth century, to give it refinement and currency; but, in later times, the *Langue d'oui* has prevailed over the *Langue d'oc*, which is now spoken by a few of the lowest class only.

The last and least genuine of the descendants of the Latin is the *Wallachian*, about one half of which is borrowed from the German, Sclavonian, and Turkish. The original Thracians of the country must have been in a great measure superseded by the successive settlements of various nations; in the third century, some of the Goths and Vandals; in the fourth, the Jazyges, after Attila's death; in the fifth, some Huns and Alans; about the end of the seventh, the Bulgarians, and afterwards the Petschenegers and Hungarians, established themselves in it; and, in the thirteenth century, Wallachia became an independent state. The Latin part of this language has much of the Italian form, and had even assumed it as early as the fifth century. It must have been derived from Roman colonies, and more lately, perhaps, from the missionaries sent into the country by Pope Gregory XI. The *Dacian* or Hungarian dialect prevails on the north of the Danube; the *Thracian*, or Cutzo-Wallachian, on the south; the latter is more mixed with Greek and Albanian. There is also a small Wallachian colony in Transylvania.

The *Cantabrian* or *Biscayan* has many words in common with the Latin, whether originally or by adoption, and was probably in some measure connected with the Celtic dialects, which were the immediate predecessors of the Latin, though still sufficiently distinct from them. The Cantabrian *Aita*, Father, has some resemblance to the Irish *At'air*, and the Mœso Gothic *Atta;* *Geru* is not wholly unlike *Cœlum;* *Ereenjaa*, *Regnum;* and *Borondatia*, *Voluntas;* the coincidence of *Gun*, Day, with the Tartarian, is perhaps more accidental. But the word *Lurre*, Earth, which seems at first sight so unlike any other language, is in all probability the derivative of *Tellure;* and this form of the word affords also a connecting link with the Irish *Talu*, and may have been contracted into the more common Latin word *Terra;* a supposition which seems to lessen the probability of the original connection of this form of the word with the Greek *Era*, and the Sanscrit *Stira*. The Biscayan is still spoken in the angles of France and Spain adjoining to the northern extremity of the Pyrenees. The same people were called Cantabrians in the north, and Iberians in the south, and extended between the Pyrenees and the Rhine, as Ligurians, or inhabitants of the coast. They have adopted a few German words, perhaps from the empire of the west Goths; and they have furnished the modern Spanish with more than a hundred original words of their own. The construction of the language is extremely intricate; its verbs have eleven moods, among which are a consuetudinary, a voluntary, a compulsory, and a penitudinary. Larramendi's *Grammar*, published at Salamanca in 1729, is called *El Impossible Vencido.* A valuable abstract of the most interesting particulars relating to the language is found in the Additions to the Mithridates, by the Baron William von Humboldt, late Prussian ambassador to the court of Great Britain, printed at Berlin 1816. Dr Young has lately remarked, in the *Philosophical Transactions* for 1819, that at least six of the words contained in Humboldt's vocabulary coincide very accurately with the Coptic, or ancient Egyptian, though they are not found in any of the languages of the neighbouring countries; and he infers that the chances are "more than a thousand to one, that, at some very remote period, an Egyptian colony established itself in Spain." It may be observed, that one of these words, *guchi*, little, appears to be also Turkish or Tartarian; so that it becomes a second instance of a coincidence between this language and the Cantabrian.

16. The connection of the Sclavonian and Lithuanian, and of the other branches constituting the SLAVIC family, with the languages of the Indo-European class in general, is sufficiently established, without exceeding the limits of the Lord's Prayer, by the resemblance of *Nebi* or *Nebesi* to the Cimbric *Nefoedd*, and the Greek *Nephos*, and of *Wolja* and *Chljeb* to the Gothic *Wilja* and *Hlaif*. The *Sclavonians* are the descendants of the ancient Sarmatians, who were situated north of the Black Sea and of the Danube. They were conquered by the Goths, and then driven by the Tartars and Huns into the north-east of Germany, and the neighbouring countries. Procopius calls them Spori, and divides them into the Sclavi and Antes, the latter, perhaps, the same as the Wends. They formed, at an early period, two principal states, Great Russia, about Novogorod, and Little Russia, on the Dnieper, its capital being Kiew. The Russi were a Scandinavian branch, under Rurik, to whom the Sclavonians of the former state submitted in 862, whence they were called Russians; and Rurik's successor, Oleg, conquered Kiew. After several vicissitudes, the Russians were liberated by Iwan Wasiliewitch, at the end of the fifteenth century; and this period was the beginning of their greatness. Their language has some mixture of Greek, Finnish, Swedish, Tartarian, and Mongol. The ecclesiastical dialect was uniformly retained in all literary works in the former part of the last century, but now the language of conversation is generally adopted in writing. This language is more immediately derived from that of Great Russia; that of the church, which is called the Slawenish, rather from Little Russia, and especially from the dialect of Servia. The *Malo-Russian* dialect is somewhat mixed with the Polish, and is spoken in Ukraine and Little Russia; the *Susdalian* is mixed with Greek and other languages, and is spoken in Thrace.

In 640, the Sclavonians took possession of Illyria, which before that time had been overrun by a variety of other nations; and they still retain it, under the names of Servians, Croatians, and Southern Wends. The *Servians* are supposed to have come from Great Servia, now East Gallicia, on the Upper Vistula; the *Croatians* from Great Chrobatia, probably situated on the Carpathian Mountains. Cyril first adapted the Greek alphabet to the Sclavonian language in Pannonia; his letters were afterwards a little altered, and attributed to St Jerome, in order to reconcile the people to their use; and in this form they are termed Glagolitic characters. The Servian dialect is intermediate between the Russian and the Croatian. The Bulgarians speak a corrupt Sclavonian, which Boscovich, from *Ragusa*, could scarcely understand. The *Uskoks* are a wild race of the Bulgarians, extending into Carniola, and speaking a mixed language. The dialect of Sclavonia and Dalmatia is nearly the same as that of Servia and Bosnia; the churches use the ecclesiastical language of Russia. In Ragusa, the orthography approaches, in some measure, to the Italian. The Servian is also imperfectly spoken by a small colony in Transylvania. The Southern *Wends* were first distinguished in 630, and were probably so named, like the Veneti, from being settled on the shores of the Adriatic, the word *Wend* or *Wand* meaning Sea. They are now mixed with Germans in Carniola, Carinthia, and Lower Stiria. In Hungary there is a small colony, who call themselves Slowens, and speak the *Wendish* dialect of the *Sclavonian*. The western Sclavonians, or the proper Sclavi, write their language in the Roman characters; but the specimens copied from Adelung are accommodated in their orthography to the German mode of pronunciation.

The *Poles* probably came with the Russians from the Danube into the countries abandoned by the Goths; the name Pole implies an inhabitant of plains. Their language was partly superseded by the Latin in the tenth century, when they received the rites of the Latin church; but it has in later times been more cultivated. The Cassubians, or Kashubians, in Pomerania, speak a Polish mixed with a little German. In Silesia, the names of places in the plains are Sclavonian; in the hills, more lately occupied, German; but German has been the language of Breslau ever since the year 1300.

The *Bohemians* emigrated with the Moravians and Slowaks into their present habitations about the middle of the sixth century, after the destruction of the kingdom of Thuringia by the Franks and Saxons. There is a Bohemian hymn of the date 990, and a chronicle in rhyme of 1310. One third of the Bohemians are of German origin, and speak a corrupt German.

The *Serbs* or Wends came about the same time into the countries between the Saal and the Oder, from the neighbourhood of the Volga or the Crimea; a few of them are still left in *Lusatia*, under the name of Wends or Sclavonians, and some in Misnia. In Pomerania the Wendish became extinct about 1400: but the *Polabes* in Lüneburg, on the Leyne, kept up till lately a language consisting of a mixture of Wendish and German. The *Sorabic* of the Russian vocabulary seems to be the same with this Serbian.

Of the *Lithuanian* or *Lettish* language, two thirds are Sclavonian, the rest is principally German. When the Goths had removed from the Baltic towards the Black Sea, their neighbours the Æstii remained for some hundred years independent, till, in the sixth century, the Sclavonians incorporated themselves with them, and formed the Lettish people and language. The *Old Prussian* was spoken, at the time of the Reformation, in Samland and its neighbourhood, but it is now lost; it contained more German than the other Lithuanian dialects. The *Prussian Lithuanian* is spoken from the Inster to Memel, especially in Insterburg. The *Polish Lithuanian*, in Samogitia, has a little mixture of Polish. The proper *Lettish* is current in Lettland and Courland; it is purest about Mittau and Riga; the old Courlanders having been Fins, this dialect has received a little Finnish from them. The *Crivingian* is another dialect, spoken by the Krewins in Courland.

17. The Tshudish or Finnish, the Hungarian, and the Albanian languages, have some traits of resemblance to each other; they are placed as forming the *sporadic* or scattered order of the great *Tataric* or Asiatic class, being in some measure geographically detached from the rest, and scattered through different parts of Europe; they immediately follow the Indo-European class, as exhibiting an occasional resemblance to some of the languages contained in it, though not enough to make it certain that the connection is essential or original. Thus the Finnish is said to have some coincidences with the Greek, the Laplandish with the Hebrew, the Hungarian with the Finnish, and the Albanian with all its neighbours.

The term *Tshudish* is employed as comprehending the Fins, Laplanders, Esthonians, and Livonians; a race of people of unknown origin, but in all probability unconnected with the Huns or Mongols. Their languages are remarkable for the great complexity of their structure; their nouns, for example, having from ten to fifteen cases, among which are reckoned, in the Finnish, a nuncupative, a conditional accusative, a factitive, a mediative, a descriptive, a penetrative, a locative, a privative, and a negative. The Esthonian has less direct variety of termination, but several intricate combinations. There is also a great multiplicity of dialects, partly from a mixture of Scandinavian, and partly from other causes; in Lapland, almost every church has a peculiar version of the service kept for its use. The *Finnish* is intermediate between the *Laplandish* and the *Esthonian.* The Esthonians are the Æstii of the Romans, the name implying Easterly, and being appropriate to the country, and not to the people. The principal dialects of their language are those of Reval and of Dorpat; some authors also consider the dialect of the Krewins in Courland as belonging to it. The *Livonian* is much mixed with other languages, and has been almost superseded by the Lettish. Amongst the Laplandish words which Rudbeck has derived from the Hebrew, we find *Aedhame*, Earth, like the Hebrew *Adameh; Hadas*, New, H. *Khadesh; Hadshe*, the Moon, H. *Hhadesh; Jed*, the Hand, H. *Id; Ise*, Man, H. *Ish; Pothi*, persuaded, H. *Pathehh; Saedke*, Law, H. *Tzedek;* and *Safothi*, Rested, H. *Sabbath.* In the Finnish, *Kana* is something like the English and German *Hen.*

18. The *Hungarians* inhabited, in the fourth century, the country of the Bashkirs, between the Tobol, the Volga, and the Jaik, perhaps as colonists, since their name signifies strangers. Their language was spoken in this neighbourhood as late as the thirteenth century; in the sixth they were conquered by some of their Turkish neighbours; in the end of the ninth they were forced by the Petschenegers, a Tartarian nation, to remove nearer to the Carpathian Mountains. They were then engaged in the German wars, and their country having been occupied during their absence by the Bulgarians, they took possession of the Bulgarian kingdom on the Theiss, as well as of Pannonia. Their language is somewhat like the Finnish, but the people are very different from the Fins in appearance; which might indeed be the effect of a difference of climate; but, in fact, the language appears to be still more like the Sclavonian, with a mixture of a multitude of others; it has some words from various Tartarian dialects, German, French, Latin, Armenian, Hebrew, Persian, and Arabic; but it has no traces of the Mongol, nor is it possible that the people can be descendants of the Huns, whose character and cast of features can never be eradicated. The word *Coach*, so general in Europe, is originally Hungarian, having been derived from the town of *Kots*, where coaches are said to have been invented. The Szecklers, in Transylvania, speak a language like the Hungarian; it is uncertain whether they are a Hungarian colony, or remains of the Petschenegers; but, however this may be, there is little doubt that the Hungarians are principally of Tartarian extraction, though much mixed with other nations.

19. The *Albanians* speak a language, of which a considerable portion is Greek, Latin, German, Sclavonian, or Turkish; but the rest seems to be perfectly distinct from any other language with which we are acquainted. They are probably connected with the Albanians between Mount Caucasus and the river Cyrus, who are supposed to be derived from the Alani; some of them seem to have entered Bulgaria as late as 1308. In 1461, many of them fled from the Turks to *Italy* and *Sicily*, where they still exist near Reggio and Messina. The Clementines are an Albanian colony, who followed the Austrian army in 1737; such of them as escaped from the pursuit of the Turks established themselves in Syrmia.

20. The languages referred to the *Caucasian* order have little to distinguish them from the rest of the class, except their geographical situation, in the immediate neighbourhood of the Caucasian Mountains. They have a general resemblance to some others of the languages of Northern Asia, and particularly to the Samojedic dialects, spoken on the mountains between Siberia and the Mongols. Except the Armenian and Georgian, they are scarcely ever employed in writing; and principally, perhaps, from this cause, they exhibit as great a diversity, in the space of a few square miles, as those of many other nations do in as many thousands. It is only conjectured that most of the inhabitants of these countries are derived from the miscellaneous fragments of expeditions of various nations, left behind in their passage through them at different periods.

The connection of the *Armenian* with the Sanscrit and the Persian, is just enough to make it equally possible that the coincidences may have been derived from a common parent, or that one language may have simply borrowed detached words from the other. We find, in different parts of Mr Townsend's work, about ten Armenian words resembling some other language; these are, *Air*, a man, *Air*, Irish; *Atamn*, a tooth, *Odonta*, Greek; *Chuerk*, four, *Chatur*, Sanscrit; *Dor*, a door; *E*, is, *Est*, Latin; *Es*, I, *Iaze*, Russian; *Gas*, a goose, *Gans*, German; *Houze*, a house; *Lakeil*, to lick, *Leichein*, Greek; and *Sirt*, the heart. Nothing is known of the history of the Armenian before the time of Miesrob, who translated the Bible into it, in 405; the historian Moses, of Chorene, was his pupil. The language flourished till the year 800, and is still preserved in tolerable purity in the cloisters. The common people speak a dialect more corrupt and mixed. The fathers of the Armenian convent at Venice have been very laudably employed in the improvement of the literature of their nation, by the publication of several very elegant editions of Armenian books, which have been executed at their press; in particular, of an Armenian translation of Eusebius, containing some passages which are not extant in Greek, and said to have been copied from a manuscript of great antiquity at Constantinople. It is, however, very remarkable, that, as they candidly confess, the copy, when first received by them, contained the corrections and additions of Scaliger, in conformity with the text of the printed Greek edition; and the copyist, when questioned, asserted that he had merely translated and inserted passages of his own accord, and in silence, in order to make the work more perfect. Still the Armenian Eusebius is a very handsome book, and every way calculated to do credit to the Venetian editors and their patrons; a Latin translation of it only has been published by Angelo Mai at Milan.

21. The *Georgians* are supposed to have derived their name from the river Cyrus or Gur, and to have extended formerly to Colchis, under the denomination of Iberians. Moses of Chorene, in the fifth century, mentions the Georgian translation of the Bible. The old language is still preserved in the churches, and the common dialect of the country is derived from it, together with the *Kartuelish*, *Imirettish*, *Mingrelish*, and *Suanetish*, which are varieties of that dialect; the *Tushetish* is mixed with some Kistic. The Georgians have no fewer than thirty-seven letters, and among them a variety of aspirates and sibilants, of no very agreeable sounds.

22. The ABASSIC nations seem to be the oldest inhabitants of the Caucasian country. 23. The CIRCASSIANS are situated to the east of them, on the promontory of North Caucasus. 24. The OSSETES, on the left of the Terek, north of the mountain; the dialect of the *Dugors* is scarcely distinguishable from this. 25. The KISTIC, spoken by the *Ingushans*, and their neighbours at the head of the Terek, is connected with the Tushetic Georgian. 26. The LESGIANS, east of Caucasus, on the Caspian Sea, have a number of distinct dialects, or rather languages. Thus, the *Chunsag* and *Avaric*, the *Dido*, the *Kasi Kumük*, the *Andi*, and the *Akushan*, have little connection with each other, except that the Dido somewhat resembles the Chunsag, of which the Avaric, the *Antsug*, and the *Dzhar*, seem to be subordinate dialects. The Kasi Kumük appears to have adopted some words of the Armenian, and the Andi and Aku-

shan of the Georgian. The dialect of Kubesha resembles that of Akusha, and retains no traces of a supposed European origin.

27. The languages of the central and elevated parts of Asia are comprehended in the order *Tartarian;* they extend from the Caspian Sea to the mouth of the Amur, through countries which have been, in former ages, the constant scenes of emigration and barbarism. The *Turco-Tartarians* are supposed to correspond to the descendants of the Magog of the Scriptures, and to some of the Scythians of the Greeks. The Turks of Turkestan seem to have been the Massagetæ and Chorasmii of the ancients; their country extended north of Persia and Thibet, from the Caspian to the Altaic Mountains. In the twelfth century they wrae brilliant and victorious; at present, a few of their descendants only are left in the neighbourhood of the Mongols, and their language is no longer spoken; the Turcomans scattered in Persia and Arabia are derived from the same race. The Osmans, now commonly called Turks, left Turkestan in 545, and succeeded in the conquest of Persia. They were denominated Osmans, from one of their leaders, in the fourteenth century. Their language has been much mixed with Arabic and Persian. This language, with the neighbouring dialects, has been considered in the table as belonging to a family called *Caspian*, the word Tartarian having been previously applied to the whole order. Several of these dialects exhibit a mixture of words from the language of the Mongols, which, as well as the Calmuck, has a sufficient connection with them to be arranged as belonging to the same Turco-Tartarian family. It would, perhaps, be equally correct to consider some of them rather as distinct languages than as dialects of a single one; but it is not easy to discriminate those which are entitled to this rank; and, on the other hand, some specimens have been admitted, from the Comparative Vocabularies, which scarcely deserved to be noticed as separate dialects. The *Bucharians* are situated between the Oxus and Jaxartes, on the river Koly. They still retain some traces of a superior degree of civilization, by which they were once distinguished. Their language is little known, but it seems to be at least as much connected with the Median and Arabian families as with the Caspian. The Tartars were described by the terms Scythians, Bulgarians, Avari, and other appellations, before they were conquered and united by Genghiz Khan the Mongol. In the year 1552 they became subject to the Russians. The most westerly are the Nogaic or Nagaic and Crimean Tartars; their language is much like the Turkish, but mixed with some Mongol. Those of Cumania in Hungary have now forgotten their original language, and speak the Hungarian, the last person who understood the Cumanian having died in 1770. They entered Hungary in 1086, and became Christians in 1410. The Tartarian, or rather Caspian, is spoken in great purity about Kasan; a dialect somewhat different in Orenburg; and another by the *Kirgishes*, who occupy part of the ancient Turkestan. "Among the Siberian Tartars, the remains of the kingdom of Turan, some are Mahometans; others, as the Turalinzic villagers, have been made Christians; at least the Archbishop Philophei performed the ceremony of baptizing them, by ordering his dragoons to drive them in a body into the river." The inhabitants of the banks of the *Tara*, a branch of the Irtish, are said to be derived from the Bucharians. The *Tshulimic* Tartars enjoy the same advantage as the Turalinzic, and are considered as Christians by the Russians. The *Teleutes*, in Sonjor, are heathens, nearly like the Shamanites of India. The *Jakuts* extend along the Lena to the sea; their language contains some Mantshuric and some Tungusic. That of the Tshuwashes, on the Volga, is said to have been once completely distinct from the Tartarian or Caspian; and even at present, though more mixed with it, may require to be classed as forming a separate species.

The *Mongols* are marked by their features as a race very different from the other Tartars; the character of their countenance seems to be easily propagated from father to son, and never to be completely effaced; their original habitation appears to have been in the neighbourhood of the Altaic Mountains. The description of the Huns, found in Ammianus, Procopius, and others, agrees exactly with the present Mongols, whom the Chinese still call *Kiong nu;* and more particularly with the Calmucks. The proper names of the Huns are also found to be explicable from the Mongol language. In the first century they were driven westwards by the Chinese: under Attila they penetrated into the middle of Europe; and they were little less successful at subsequent periods, under Genghiz Khan and Timur Leng. When they were expelled from China, after having held it in subjection for more than a century, they carried back no civilization with them; nor was either of the languages permanently affected by this temporary mixture of the nations, although the physiognomy of the Chinese bears ample testimony of its having once existed. The construction of their language seems to be very indirect and figurative. Mr Townsend has copied from General Vallancy a long list of words, in Strahlenberg's *Mongol Vocabulary*, which agree very remarkably with the Irish; among these we find *Are* and *Ere*, man, Irish *Ar*, *Air*, *Fear;* *Arul*, a spindle, Irish *Oirle;* *Alemamodo*, an apple-tree, Irish *Amhalmhaide;* *Asoc*, to ask, Irish *Ascadh;* *Baiehu*, I live long, Irish *Baoth*, long life; *Bugu*, a buck, Irish *Boc*, a he goat; *Choy*, a ewe, Irish *Choi;* and *Choraga*, a lamb, Irish *Caorog;* without going any further in the alphabet. The last two instances are very striking, and seem to point very strongly at that part of the east from which the Celts may be supposed to have originally emigrated. The *Calmuck* dialect is somewhat mixed with the neighbouring Tartarian. The Tagurians, or Daurians, between the lake Baikal and the Mongol Hills, are said to be of Mantshuric origin; but their language evidently resembles the Calmuck. The *Burattish* is from the Russian Vocabularies.

28. The *Mantshurians* are sometimes improperly called Eastern Mongols; they are subjects of the empire of China. Their language is rude, and not much like the Chinese, though evidently derived from the monosyllabic class. It has some few words in common with the European languages, as *Kiri*, patient, *Kirre*, German, *Cicur*, Latin, tame; *Furu*, *Furor;* *Lapta*, rags, *Lappen*, German; *Sengui*, blood, *Sanguis;* *Ania*, a year, *Annus*; but, considering the remoteness of their situation, we can scarcely form any conclusion from the occurrence of these resemblances. M. Abel Rémusat held the appointment of professor of this language at Paris; but it was found difficult for him to render its study very popular in the midst of so busy a metropolis. Whether the language of the island of *Sagalien*, opposite to the mouth of the Amur, is a dialect of the Mantshuric, or totally distinct, and requiring to be classed with the insular languages, appears to be not yet sufficiently ascertained. The *Corean* has been supposed to be a mixture of Mantshuric and Chinese: the Coreans do not understand either of those languages when they are spoken, but this fact is perfectly compatible with the supposition.

29. The *Tungusians*, in the east of Siberia, subject to the Chinese, speak a peculiar language, mixed with some Mongol. The Russian vocabularies contain specimens of a variety of their dialects, besides those of the Tshapogirs on the Jenisei, and the Lamuti on the Sea of Ochotsk, none of them particularly interesting or remarkable.

30. The languages belonging to the *Siberian* order occupy the principal part of the north of Asia, between the mountainous Tartarian territory and the Frozen Sea. At the commencement of this order, we find a variety of in-

considerable nations in the neighbourhood of the confines of Europe and Asia, which have their distinct languages, probably formed, in times comparatively modern, out of the fragments of others. They have almost all of them some Finnish words, but none a sufficient number to justify us in considering them as dialects of the Finnish language, although the people were very probably connected with the Fins as neighbours, in the middle ages, on the banks of the Dwina and elsewhere. The *Sirjänes,* in the government of Archangel, speak nearly the same language with the *Permians,* who are partly in the same government, and partly in that of Kasan. The *Wotiaks,* on the Wiatka, also in Kasan, have a dialect which seems to be intermediate between the Permian and the Tsheremissic. 31. The *Woguls,* situated on the Kama and the Irtish, afford specimens of several dialects in the Russian collection; they seem to have borrowed a few words from the Hungarian, and much more from the language of the *Ostiaks* (32), who are also divided into several races. 33. The *Tsheremisses,* situated on the Volga, in Kasan, have a little mixture of Turco-Tartarian. 34. The *Morduins,* on the Oka and Volga, have about one eighth of their language Finnish, and also some Turco-Tartarian words. The *Moktanic* is a dialect differing but slightly from the Morduin. 35. The *Teptjerai* are people paying no taxes, who originated from the relics of the Tartaro-Kasanic kingdom in the sixteenth century, and who are said to speak a language peculiar to themselves. The arrangement of all these dialects must remain very imperfect, for want of a greater number of specimens of their peculiarities.

36. The *Samojedic* nations are situated north of the Tartars, by whom they may possibly have been driven into their present habitations. Their languages seem to have some affinity with the Caucasian and Lesgian dialects, and some of them with the Wogulic and Ostiak families; the specimens in the Comparative Vocabularies seem to have been multiplied somewhat too liberally. 37. The *Camashes* are situated on the right of the Jenisei; they are Shamanites or Buddists; their language seems to be a mixture of several others, and is divided into several very distinct dialects. The *Koibals* have been baptized; they have borrowed some words from the Turco-Tartarian family. The *Motors* are situated on the Tuba. 38. The Ostiaks on the river Jenisei afford us five specimens of languages totally different from those of the Ostiaks already mentioned, but nearly connected with each other, so that they may properly be called *Jenisei-Ostiaks.* 39. The *Jukagirs,* or *Jukadshirs,* are few in number; they are situated between the Jakuti and the Tshutshi; they have some Jakutish words mixed with their language, and some Tsheremissic. 40. The *Koriaks* and the *Tshutshi* occupy the north-easternmost point of Siberia; the proper Koriak is spoken on the bay of Penshin; the *Kolymic* on the river Kolyma, the *Tigilic* on the Tigil in Kamtschatka, and the *Karaginic* on the island Karaga; the Tshutshic has been considered as a dialect of the Koriak. 41. The *Kamtschatkans* are a little further south; the *Tigilic Kamtschatkan* is found, however, on the north of the Tigil; the *Srednish* to the west, on the Bolshaia, and the *Jozhnyshic* on the river Kamtschatka, and towards the South Cape. The languages of the neighbouring parts of America, according to Professor Vater, greatly resemble the Tshutshic.

The *Insular* order of the Tataric or Atactic class of languages must be understood as comprehending all the Asiatic islands east of Borneo. 42. The language of the *Curilees* is spoken not only in the principal of these islands, but also in Kamtschatka, about Cape Lopatka; but in some of the islands the Japanese is spoken. The *Japanese* derive themselves from the Chinese, but their language contradicts this opinion; they have evident traces of Mongol extraction or relationship. The amiable islanders of *Loochoo* will long be remembered by the British public, for the hospitality they showed to the Alceste and the Lyra; their language appears to be related to the Japanese, as might be expected from their situation. *Formosa* was conquered by the Dutch in 1620, but in 1661 it was taken from them by a Chinese pirate: the next year some books were printed in the Formosan language in Holland, the recapture of the island not being yet known there; in 1682, it was finally given up to the Chinese government. 47. The *Moluccan* is considered by Dr Leyden as an original language; that of Magindanao contains some Malayan, Moluccan, Tagalish, and Bugis. The *Tagalish,* or *Gala,* is the principal language of the *Philippines,* and almost as generally understood in that neighbourhood as the Malay and Hindustanee in other parts; it is allied to the Malayan and to the Javanese, and was probably derived in great measure from these languages; it also resembles in some measure the Bugis. The *Bissayish* is a ruder dialect of the Tagalish. The *Sulu* differs but little from these dialects, being derived from the same sources. The *Bugis* is the language of Celebes; it is supposed to be more ancient than the Javanese; it seems to contain no Sanscrit, but much Malay, Tagalish, and Javanese, and some of the old Ternate, or Moluccan; it is written in a peculiar character, and some good poetry is found in it. There is a dialect called the *Mungharar.* The *Bima* somewhat resembles this dialect; it is spoken in the eastern parts of Sumbawa, and the western of Endé or Flores; it is written either in the Bugis or the Malay character; it seems to have a distant resemblance to the language of Orissa. The dialect of *Sumbawa* exhibits some slight variations. A few single words, as *Matta,* the eye, and *Matte,* death, are found to coincide in almost all the islands of the *Pacific Ocean;* the languages of which, notwithstanding their immense distances, seem to differ less than those of the inhabitants of some very small continental tracts; and they might probably be divided into a few well-defined families, if our knowledge of them were more complete. The resemblance of *Matte* to the Arabian *Mot,* and the Latin *Mactare,* is probably accidental.

The number of the AFRICAN languages is supposed to amount to one hundred or one hundred and fifty, and as many as seventy or eighty of them have been distinguished with tolerable accuracy. The population of Africa seems to have been derived from Arabia, and, as some critics think, rather from the southern than from the northern parts; a great number of its present inhabitants are negroes, but these cannot be distinguished from the rest by any infallible criterion. The account given by Ptolemy of the interior part of the country appears to be wonderfully accurate and extensive; although some of his measures seem to be erroneous, and not sufficiently reconcileable with the truth, even by adopting Major Rennell's hypothesis respecting them. It is however remarkable that Ptolemy followed Hipparchus in extending the eastern coast of Africa to the Ganges, although more correct ideas of its form had been entertained at Alexandria before his time.

The *Egyptians* demand the priority in treating of the inhabitants of Africa, from their early connection with ancient history, both sacred and profane. It is observable that the representations of the old Egyptians have countenances more or less approaching to the negro physiognomy, though the dry bones of the skeleton have that character somewhat less decidedly than they must have had when clothed with the thick lips and flattish noses of the generality of the representations; at the same time there are sculptures of great antiquity, which exhibit features not unlike those of correct Grecian or Roman beauty; and others have a considerable resemblance to the Arabian nation. At present the people of middle Africa in general are more or less like negroes, but they are somewhat less dark, and their noses and lips are less peculiar; the women sometimes screamed if Burckhardt made his appearance on a sudden, and called him the Devil, because he was white. The Egyptians are supposed by some writers to have received their civilization from Ethiopia; but there are at present no traces of the remains of high civilization farther south than Nubia, except a few scattered monuments about Axum, of no great antiquity. The Egyptians were at first called Copts by the Saracens, and their language has been commonly distinguished by the appellation *Coptic*, that is, as written in characters which are principally Greek, and frequently intermixed with a number of pure Greek words; but not a single fragment of Coptic has yet been discovered in this form that is earlier than the establishment of Christianity in Egypt; and it seems probable that the character was introduced by the early Christians at the time of the translation of the Scriptures into Coptic, which is certainly of very high antiquity. The Greek authors frequently mention an Egyptian alphabet of twenty-five letters; but no traces of any such alphabet are found in the multitudinous inscriptions or manuscripts that have been preserved by the exertions of the numerous and adventurous travellers who have lately visited the country. The Greek words mixed with the Coptic are not considered by the grammarians as incorporated with the language, nor are they admitted into the dictionaries. The genuine language bears very evident marks of great antiquity; its construction is simple and often awkward; and a great number of its words are monosyllables. We have positive evidence of its having remained unaltered from the time of Herodotus, Plutarch, and other Greek authors; and it affords us the etymology of the name of Moses, and of some other words mentioned in the Scriptures. It exhibits a few coincidences with other ancient languages, but not enough to enable us to consider it either as the offspring or the parent of any of them, except that it gives us something like an explanation of the meaning of some of the Greek particles. Out of one hundred and fourteen original Egyptian words, there are fifty-two that resemble the Greek, twenty-seven the German and English, eighteen the Hebrew, three the Syriac, two the Arabic, two the Sanscrit, one the Sclavonian, and one the Cantabrian. It is, however, probable, that a person more intimately acquainted with the languages of the Arabian family would have been able to find a much greater number of coincidences, since nations which had so much intercourse as the Jews and the Egyptians could scarcely fail to have many words in common, even if their languages had been at first completely different; and probably many of the Arabic roots, which are not Hebrew, may be found in the Egyptian. To the Cantabrian word inserted in this enumeration, Dr Young added five others, the whole six being *Berria*, new; *Ora*, a dog; *Guchi*, little; *Oguia*, bread: " Otsoa," a wolf, whence the Spanish *Onza;* and *Shashpi*, seven: in Coptic, *Beri*, new; *Uhor*, a dog; *Kudshi*, little; *Oik*, bread; *Uonsh*, a wolf; and *Shashf*, seven. Hence he infers, that " if we consider these words as sufficiently identical to admit of our calculating upon them, the chances will be more than a thousand to one that, at some very remote period, an Egyptian colony established itself in Spain; for none of the languages of the neighbouring nations retain any traces of having been the medium through which these words have been conveyed. On the other hand," he continues, " if we adopted the opinions of a late learned antiquary," General Vallancey, " the probability would be still incomparably greater that Ireland was originally peopled from the same mother country; since he has collected more than one hundred words which are certainly Egyptian, and which he considers as bearing the same sense in Irish; but the relation, which he has magnified into identity, appears in general to be that of a very faint resemblance; and this is precisely an instance of a case in which it would be deceiving ourselves to attempt to reduce the matter to a calculation." It may, indeed, be imagined that the Egyptian dominions may formerly have extended to the Straits of Gibraltar, and that Spain may have derived a part of its population from this part of Africa, which approaches so near to it; but it could scarcely have happened that no traces of Egyptian monuments should ever have been found at any distance from the Nile, if that active people had really occupied any considerable portion of the neighbouring continent. The word *Chemistry*, in Greek *Chemia*, is well known to be derived from the Egyptian; it has successively been compared, by the Quarterly Reviewer, to *Chim* or *Chem*, heat, and to *Chem*, secret, the latter being the more probable origin of the two; and a third etymon might be found, if it were required, in the *Dshem*, or *Ghem*, to find, or Invention. The Coptic language has been nearly extinct for about two centuries; but the service has been read in Coptic much more lately in some of the churches, though it has now been almost entirely superseded by the Arabic. The proper Coptic, or Memphitic, which was the dialect of Lower Egypt, is supposed, from a word quoted by Herodotus, to be the most ancient; the Sahidic or Thebaic of Upper Egypt was probably preserved for a longer time, especially in some of the monasteries; there is a separate version of the principal part of the *Bible* in this dialect, fragments of which have been published by Mingarelli and Woide; a third dialect, much resembling the Thebaic, is commonly called the Bashmuric; and a fourth, the Oasitic, has been partially made known by Mr Quatremère de Quincy. The Egyptians have left no traces of their language among the people who at present occupy the countries that they inhabited; the Nubian vocabularies collected by Burckhardt contain no Coptic words; the people are of different Arab races, but have acquired peculiar dialects, probably mixed with those of the neighbouring negro nations, of several of which we find specimens in Mr Salt's *Voyage to Abyssinia.* But one of the most learned, as well as the most adventurous and industrious, of modern travellers, has remarked some coincidences between the old Egyptian language and that of the Barabras, who are neighbours of the Nubians, and extend to the confluence of the Tacazze and the Nile. The Geez and Amharic have already been mentioned as descendants of the Arabian family; they seem to have introduced some traces of this extraction into several of the neighbouring dialects, probably by the translations of the Scriptures, or by the use of the Koran. Professor Vater has taken some pains to prove that the language of Amhara, the Camara of Agatharchides, is wholly independent of the Ethiopic and Arabian; but in this he appears to be mistaken. It exhibits some slight resemblance to the Sanscrit, in a few instances; thus, *Tshegure* is hair, in Sanscrit, *Tshicura.* Macrizi tells us, that there are, in the whole, fifty Abyssinian dialects; but he has probably exaggerated their number. We have obtained more authentic information respecting them from the collections of Bruce, and of his editor, Murray, and still more lately from Dr Seetzen and Mr Salt. Of the Mek of Dongola, the representative of a long race of the Christian kings of Nubia, little is now known, except that he is in a great measure dependent on the king of Sennaar on the one hand, and has been expelled from a part of his territories by the Mamelukes on the other. Of the Agows and the Gafats, neighbours of the Abyssinians, and situated on the Bahr el Azrek, as well as the Jewish Falashas, who are scattered over the country, especially in Dembea, we have read much in the historical romances of Mr Bruce, which certainly give a faithful picture of the countries to which they relate, notwithstanding some unaccountable inaccuracies with respect to the personal adventures of the author.

The north of Africa is occupied by inhabitants not much differing in appearance from the Arabs. Its three principal divisions are the coast, the country of wild beasts, and the desert. The later Arabs have expelled the earlier Africans from the first division, and partly from the second; the Berbers occupy the third, inhabiting principally the Oases, or cultivable islands, scattered through the desert from Mount Atlas to Egypt, and speaking, as Horneman first ascertained, the same language throughout this vast extent. They were first well described by Leo Africanus: they are probably the remains of the Mauritanians, Numidians, Gætulians, and Garamatians. There is no foundation whatever for the opinion of some modern authors of celebrity, that their language is derived from the Punic. We even find, from Sallust, that the Numidian language differed from the Carthaginian, and from Valerius Maximus; that it was written in a peculiar character, perhaps the same with that which is found in the inscriptions from Lebeda, now in the court of the British Museum. The language of the *Canaries* considerably resembles the Berber; thus, milk is *Acho* in Berber, and *Aho* in the Canaries. These islands were discovered in 1330, and afterwards conquered, with some difficulty, by the Spaniards. The inhabitants were a fine race of men, and lived in comfort and tranquillity; and they still present some traces of their original character and condition.

The country between the desert Zahara and the Niger is inhabited by a race of people who have a great resemblance to negroes, but are somewhat different from them. In the east are those of *Soudan* or *Afnu*, and *Begermah;* in the west the *Foulahs;* the *Fellatas* are a branch of these, extending considerably to the north-east, with a mixture of negroes.

Of the languages of the negroes, strictly so called, many interesting specimens have been collected by the zeal of the evangelical missionaries in the Caribbee Islands, and published by Oldendorp, in his Account of the Mission; but they do not afford us sufficient materials to enable us to trace any extensive connections or dependencies among their multifarious dialects.

There are some points of coincidence between the language of *Madagascar* and those of the Malays, the Philippine islanders, the *Beetjuana* Caffres, and the *Corana* Hottentots: there are also a few words, in many of the African dialects, borrowed from the modern Arabic, not, as Court de Gebelin would persuade us, from the Phœnician. Nor can any other of the affinities be very distinctly established.

The *Caffres* have little of the negro character except the black colour, and less of this as they become more remote from the equator. They are supposed to extend across the whole of Africa, immediately north of the Hottentots, as far as Benguela and Quiloa. The *Hottentots*, with their neighbours the *Bosjemen*, speak different dialects of the same singular language, in different parts of their country. Of that of the *Dammaras*, little or nothing is known. Lichtenstein has classed them as Hottentots; but Barrow, who was better acquainted with them, considers them as Caffres.

(Gesner, *Mithridates de Differentiis Linguarum*, Zurich, 1555, 8vo; Megiser, *Specimen XL. Linguarum*, 1592; Duret, *Thrésor de l'Histoire des Langues*, 4to; Lüdeken (Müller), *Specimina Linguarum*, Berl. 1680; Chamberlayne, *Oratio Dominica*, Amst. 1715; Schultz, *Orientalischer und Occidentalischer Sprachmeister*, Leipz. 1748; Hervas, *Saggio*, Hervas, *Idea dell' Universo*, Cesenn. 1778–87, vol. xvii.–xxi. 4to; *Vocabularia Comparativa*, 2 vols. 4to, Petersburg, 1787, 4 vols. 1790; Bergmann, *Specimina*, Ruien, 1789; Marsden's *Catalogue of Dictionaries and Grammars*, 1796; Marcel, *Oratio Dominica*, Paris, 1805; Adelung und Vater, *Mithridates, oder allgemeine Sprachkunde*, 4 vols. 8vo, Berlin, 1806–17; Le Pileur, *Tableaux Synoptiques de Mots similaires*, 8vo, Paris and Amst. 1812; Jamieson's *Hermes Scythicus*, 8vo, Edin. 1814; Townsend's *Character of Moses*, vol. ii. 4to, Bath, 1815; Leyden, *Asiatic Researches*, x.; *Brief View of the Baptist Missions and Transactions*, 8vo. Lond. 1815; Vater, *Index Linguarum totius Orbis*, 8vo, Berl. 1815; Vater, *Proben Deutscher Mundarten;* Seetzens *Nachlass*, 8vo, Leipz. 1816; Arndt, *Ursprung und verwandtschaft der Europäischen, Sprachen*, 8vo, Frankfort, 1818, compared with the Russian; Volney *sur l'Etude Philosophique des Langues*, 2d edit. 8vo, Paris, 1820; laments that he has not the *happiness* to understand German; *Quarterly Review*, No. xix. 8vo, Lond. 1813, xxvii. 1816.)

LANGUED, in *Heraldry*, expresses such animals whose tongue, appearing out of the mouth, is borne of a different colour from the rest of the body.

LANGUEDOC was, previously to the revolution, the name of a large province of France, two hundred and twenty miles in length, by one hundred and twenty in breadth. It was divided into Upper and Lower Languedoc, Toulouse being the capital of the former, and Montpellier, so celebrated for the salubrity of its climate, the capital of the latter. Languedoc is now divided into the departments of Gard, Hérault, Ardèche, Lozère, Tarn, Upper Garonne, Aude, and Upper Laine. These will be found described in their regular alphabetical order.

LANGUET, HUBERT, one of the boldest political writers of the sixteenth century, was born in 1518, at Viteaux, a town in Burgundy, of which his father was governor. He early evinced an inclination for study, and at the age of nine not only understood, but spoke, Latin. Having completed his studies, he resolved to travel. He set out for Germany, where the learned Joachim Camerarius had little difficulty in embuing him with the principles of the reformers; but the tumultuous scenes of which he was a daily witness determined him to pass into Italy, there to await the return of tranquillity. He remained some time at Padua, where he studied civil law, and took his degree of doctor in 1548. He then rapidly visited the principal cities of Italy, and hastened his return to Germany, being urged by a desire to make the acquaintance of Melancthon, whose works had afforded him very great pleasure. He arrived at Wittemberg in the course of the year 1549; and, as long as Melancthon lived, he returned annually to pass the winter at Wittemberg. From 1551 to 1560 he visited Sweden, Denmark, Lapland, and made two journeys into Italy; the first to satisfy his curiosity on different points, and the second in the suite of Adolphus Count of Nassau, who had desired to have the pleasure of his society. In 1565 he entered the service of Augustus, elector of Saxony, who afterwards sent him to France to congratulate Charles IX. on the re-establishment of peace in his dominions. Languet then accompanied the elector to the siege of Gotha, of which he has left a good account; and was deputed, in 1568, to attend the diet of Spires. In 1570 he assisted at the conferences of Stettin, and was sent into France the same year to compliment Charles IX. on his marriage, and at the same time to engage him to cause the treaties which guaranteed to the Protestants the free exercise of their religion, to be observed. He was at Paris on the day of the massacre of St Bartholomew, and made so many efforts to save the printer Wechel, and Duplessis-Mornay, both his intimate friends, that he drew on himself the attention of the assassins, and would have fallen a victim to his humane exertions, had it not been for the affection of Morvilliers, bishop of Orleans, who kept him concealed. Being soon afterwards recalled to Saxony, he was sent to Vienna in 1574. In 1577 he passed into the service of the count palatine John Cassimir, and then attached himself to the Prince of Orange, who employed him usefully in different negotiations. Languet died at Antwerp on the 30th of September 1581. His works are, 1. Historica Descriptio susceptæ a Cæsarea majestate executionis Augusto Saxoniæ septem viro duce contra S. Romani imperii rebelles, eorumque receptatorem et captæ urbis Gothæ, 1568, in 4to; 2. Harangue fait au Roi Charles IX. de la part des Princes Protestants d'Allemagne, inserted in the *Mémoires du Règne de Charles IX.* (vol. i.); 3. Epistolæ Politicæ et Historicæ ad Philipp. Sydnæum, Francfort, 1630, in 12mo; 4. Epistolæ ad Joachimum Camerarium, et filium, Groningen, 1646, in 12mo; 5. Arcana sæculi decimi-sexti, seu Epistolæ secretæ ad Principem suum Augustum Saxoniæ Ducem, Halle, 1699, in 4to; 6. Apologie ou Défence de Guillaume, prince d'Orange, contre le ban et l'édit du roi d'Espagne, Antwerp or Delft, 1581, in 4to; 7. Vindiciæ contra Tyrannos, sive de Principis in Populum, Populique in Principem legitima potestate, Basil, 1579, in 8vo. This last work, which went through a great number of editions in Germany and Holland, was published by the author under the name of Junius Brutus; and was afterwards translated into French by François Estienne, under the title, *De la Puissance légitime du Prince sur le Peuple.* By a singular anomaly, the translation is now much more rare than the original. (A.)

LANGUET, *John-Baptist-Joseph*, a doctor of the Sorbonne, was born at Dijon in 1675. He was received into the Sorbonne in 1698, and attached himself to the community of St Sulpice, to which parish he rendered important service. M. de la Chétardie, the vicar, conscious of his talents, chose him as his curate, in which capacity he officiated for nearly ten years, and in 1714 succeeded to the vicarage. His parish church being small and out of repair, he conceived the design of building a church suitable to the size of the parish, which he began with the sum of a hundred crowns, but soon obtained considerable donations; and the Duke of Orleans, regent of the kingdom, granted him a lottery, and laid the first stone of the porch in 1718. It was consecrated in 1745, M. Languet having spared neither labour nor expense to render it one of the finest churches in the world, both for architecture and ornament. Another work which did him no less honour was the *Maison de l'enfant Jesus.* This establishment consisted of two parts; the first composed of about thirty-five poor ladies of good families, and the second of more than 400 poor women and children of town and country. The order and economy in this house, for the education and employment of so many persons, gave Cardinal Fleury so high an idea of the vicar of St Sulpice, that he proposed to make him superintendent-general of all the hospitals in the kingdom; an appointment, however, which he declined. M. Languet was not only singular in this warm, disinterested, and benevolent conduct, but also in other circumstances equally rare, namely, the refusal of several bishoprics which were offered him. He even resigned his vicarage in 1748, but continued to preach every Sunday at his own parish church, and to support the *Maison de l'enfant Jesus*, to his death, which happened in 1750.

LANGUOR, amongst physicians, signifies great weakness and loss of strength, attended with a dejection of mind, so that the patients can scarcely walk or even stand upright, but are apt to faint away.

LANHAM. See LAVENHAM.

LANIARD, or LANYARD (from *Lanier*, Fr.), a short piece of cord or line fastened to several machines in a ship, and serving to secure them in a particular place, or to manage them more conveniently. Such are the lanyards of the gun-port, the lanyard of the buoy, the lanyard of the cat-hook, and others. The principal lanyards used in a ship, however, are those employed to extend the shrouds and stays of the masts by their communication with the dead eyes, so as to form a sort of mechanical power resembling that of a tackle. These lanyards are fixed in the dead eyes as follows: One end of the lanyards is thrust through one of the holes of the upper dead eye, and then knotted to prevent it from drawing out; the other is then passed through one of the holes in the lower dead eye, whence, returning upwards, it is inserted through the second hole in the upper dead eye, and next through the second in the lower dead eye, and finally through the third holes in both dead eyes. The end of the lanyard being then directed upwards from the lowest dead eye, is stretched as stiff as possible by the application of tackles; and, that the several parts of it may slide with more facility through the holes of the dead eyes, it is well smeared with hog's lard or tallow, so that the strain is immediately communicated to all the turns at once.

LANIGEROUS, an appellation given to whatever bears wool.

LANISTA, in *Antiquity*, is sometimes used to signify an executioner, but more frequently a master gladiator, who taught the use of arms, and had always people under him ready to exhibit shows of that kind. For this purpose they either purchased gladiators, or educated in that art children who had been exposed.

LANJANG, or LANTCHANG, a city of Laos, situated on the river Mecon, of which we have no very exact accounts. It is said to be extensive and splendid. The palace of the sovereign is equal in extent to a city, while those of the grandees are large and elegant. The dwellings of the lower orders are, as usual in the East, mere huts. Long. 104. 38. E. Lat. 18. 30. N.

LANNION, an arrondissement of France, in the department of the Northern Coasts, extending over 403 square miles, and containing a population of 90,500 persons. It is divided into seven cantons and fifty-nine communes. The capital is a city of the same name, situated on the river Guer, about two miles from the sea, and contains 3200 inhabitants. In the neighbourhood are some mines, which yield some iron and a little silver.

LANSQUINET, the name of a game at cards, which is of French origin. It may be played at by any number of people, though a single pack of cards is used during the deal. The dealer, who possesses an advantage, shuffles the cards, and, after they have been cut by another of the party, deals out two cards on his left hand, turning them up, then one for himself, and a fourth which he places on the table for the company, and which is called the *rejouissance.* On this card any or all of the company, the dealer excepted, may put their money, which the dealer is compelled to answer. The dealer continues turning the cards upwards, one by one, till two of a sort come up, that is to say, two aces, two deuces, or the like, which, to prevent mistakes, or their being considered as single cards, he places on each side of his own card; and as often as two, three, or the fourth sort of a card comes up, he invariably places, as before mentioned, on each side of his own card. The company has a right to take and put money upon any single card, unless the dealer's card should happen to be double, which is often the case, by his card being the same as one of the two hand-cards which he first dealt out on his left hand. Thus he continues dealing till he brings either their cards or his own. Whilst the dealer's own card remains undrawn, he wins; and whichever card is turned up first, loses. If he deals out the two cards on his left hand, which are styled the *hand-cards*, before his own, he is entitled to deal again. This advantage amounts to no more than his being exempted from losing, when he turns up a similar card to his own, immediately after he has turned up one for himself. Lansquinet is often played without the *rejouissance*, the dealer giving every one of the party a card to put his money upon. It is often played also by dealing only two cards, one for the company and the other for the dealer. It should be observed, that a limitation is generally fixed for the sum to be placed upon any card or number of cards, either in gold or silver, beyond which the dealer is not obliged to answer.

LANTERN, or Lanthorn, a device to carry a candle in, being a kind of cover usually made of tinned iron, with sashes of some transparent matter, as glass, horn, or the like, to transmit the light.

Dark Lantern, one with only one opening, which may also be closed up when the light is to be entirely hid, or opened when there is occasion for the assistance of the light to discover some object.

Magic Lantern, an optical machine, by which little painted images are represented so much magnified, as to be accounted the effect of magic by the ignorant.

Lantern, in *Architecture*, a little dome raised over the roof of a building, to give light, and serve as a crowning to the fabric.

The term *lantern* is also used to signify a square cage of carpentry placed over the ridge of a corridor or gallery, between two rows of shops, to illuminate them.

Lantern, on board of ship, a well-known machine, of which there are many in a ship, particularly for the purpose of directing the course of other ships in a fleet or convoy; as the poop and top lanterns, &c.

Feast of Lanterns, in China, is a celebrated feast held on the fifteenth day of the first month, and so called from the infinite number of lanterns which are hung out of the houses and streets. On this day are exposed lanterns of all prices, some of them very costly.

LAOCOON, in fabulous history, a son of Priam and Hecuba, or, according to others, of Antenor or of Capys. Being priest of Apollo, he was commissioned by the Trojans to offer a bullock to Neptune, in order to render him propitious. During the sacrifice two enormous serpents issued from the sea, and attacked Laocoon's two sons who stood next to the altar. The father immediately attempted to defend his sons; but the serpents falling upon him, squeezed him in their complicated coils, and he died in the greatest agony. This punishment was said to have been inflicted upon him for dissuading the Trojans from bringing into the city the fatal wooden horse which the Greeks had consecrated to Minerva, as also for his impiety in hurling a javelin against the sides of the horse as it entered within the walls. According to Hyginus, he suffered this punishment for his marriage against the consent of Apollo, or, according to others, for his polluting the temple, by his commerce with his wife Antiope before the statue of the god.

Laocoon, in the history of the arts, is a celebrated monument of Greek sculpture, executed in marble by Agesander, Polydorus, and Athenodorus, the three famous artists of Rhodes. Agesander is supposed to have been the father of the two latter. This remain of antiquity was found at Rome in the ruins of the palace of Titus, in the beginning of the sixteenth century, under the pontificate of Julius II. and afterwards deposited in the Farnese Palace. Laocoon, the priest of Apollo and Neptune, is here represented, along with his two sons, with two hideous serpents clinging round his body, gnawing it, and injecting their poison. This statue exhibits the most astonishing dignity and tranquillity of mind in the midst of the most excruciating torments. Pliny[1] says of it, that it is *Opus omnibus pictoreæ ex statuariæ artis, præferendum.*

LAODICÆA on the Lycus, in *Ancient Geography*, a town of Phrygia, at first called *Diospolis*, then *Rhoas*. It was built by Antiochus, son of Stratonice, and called after his consort *Laodice*.

Laodicæa on the Sea, in *Ancient Geography*, according to Strabo, was a town of Seleucis in Syria, extremely well built, with a commodious harbour. The country about it yielded great quantities of wine. The city took its name from Laodice, mother of Seleucus, the founder of it.

LAOMEDON, a king of Troy, whose history is involved in fables. He was son of Ilus king of Troy, and married Strymo, called by some Placia, or Leucippe, by whom he had Podarces, afterwards known by the name of Priam, and Hesione. He built the walls of Troy, and was assisted by Apollo and Neptune, whom Jupiter had banished from heaven, and condemned to be subservient to the will of Laomedon for one year. When the walls were finished, Laomedon refused to reward the labours of the gods, and soon afterwards his territories were laid waste by the sea or Neptune, whilst his subjects were visited by a pestilence sent by Apollo. Sacrifices were offered to the offended divinities; but the calamities of the Trojans increased, and nothing could appease the gods, according to the words of the oracle, but annually to expose to a sea monster a Trojan virgin. Whenever the monster appeared, the marriageable maidens were assembled, and the lot decided which of them was doomed to death for the good of her country. When this calamity had continued for five or six years, the lot fell upon Hesione, Laomedon's daughter. The king was unwilling to part with his daughter, whom he loved with uncommon tenderness, yet conscious that his refusal would greatly irritate the wrath of the gods. In the midst of his fear and hesitation, Hercules came and offered to deliver the Trojans from this public calamity, if Laomedon would promise to reward him with a number of fine horses. The king consented; but when the monster was destroyed, he refused to fulfil his engagements, and Hercules was obliged to besiege Troy and take it by force of arms. Laomedon was put to death, after a reign of twenty-nine years; his daughter Hesione was given in marriage to Telamon, one of the conqueror's attendants; and Podarces was ransomed to the Trojans, and placed upon his father's throne. According to Hyginus, the wrath of Neptune and Apollo was kindled against Laomedon because he had refused to offer as a sacrifice on their altars all the first-born of his cattle, according to a vow which he had made.

LAON, an arrondissement in the department of the Aisne, in France. It is 960 square miles in extent, is divided into eleven cantons, and these into 291 communes; and contains 141,650 inhabitants. The capital is the city of the same name, situated on a hill in an extensive plain. The ancient cathedral is the only remarkable edifice. It contains 1600 houses, and 7000 inhabitants, who are employed in preparing hosiery and leather, and in trading in corn and wine. In this plain the army of Marmont was defeated by Blucher on the 9th of March 1814, and that commanded by Bonaparte on the two following days, which led to the capture of Paris. Long. 3. 32. 7. E. Lat. 49. 33. 54. N.

LAOS, a kingdom of India beyond the Ganges, extending from the twelfth to the eighteenth degrees of north latitude, and having Tonquin and Cochin-China on the east, Cambodia on the south, Siam on the west, and an

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[1] Lib. xxxvi. c. 5.

Lapa Isle.
Laperouse.

unexplored region on the north. Of this extensive country all the knowledge which we possess is derived chiefly from Portuguese writers, and from the report of traders; and the accounts are frequently contradictory. All accounts agree, however, that the country is in general poorly cultivated, and thinly inhabited; the smaller villages consisting of collections of huts, and a great part of the population being merely erratic hordes, who live in a migratory state. These tribes are of very warlike habits, and wage almost constant war with each other. They are accustomed to the use of fire-arms. In their persons they resemble the southern Chinese, being of an olive complexion, and in their dispositions are frank and honest. This country carries on commerce with Tonquin and Cochin-China, to which it sends elephants, precious stones, gold, musk, ivory, wax, bamboos, and cotton; and in exchange receives salt, salt-fish, oil, silken stuffs, fire-arms, and gunpowder. This trade is chiefly carried on by the Chinese and Tonquinese merchants, and a caravan occasionally comes from Siam. The people of this country are only nominally subject to the Cochin-Chinese, their independence being secured partly by the insalubrity, and partly by the inaccessible nature, of their country. There is a tradition of a higher state of knowledge among the people in former times; and a considerable number of books is said to have been written in the Bali language. But there are no longer any traces of this high civilization. The people are ignorant and superstitious. The belief in magic is general; and the physician exercises the double profession of doctor and conjuror, and by the latter trade makes considerable gains.

LAPA ISLE, one of the Sooloo Isles, situated due south from the island of Sooloo. The land is high and woody, and forms good shelter from the south-west and north-west winds.

LAPATHUS, LAPETHUS, or LEPITHUS, in *Ancient Geography*, a town of Cyprus, with a port or station for ships, and a cognominal river. It was built by a colony of Phœnicians, according to Scylax; by Belus king of Tyre, according to Alexander Ephesus. According to Strabo, it was built by a colony of Spartans; and one of the nine kings resided here, the last of whom was Pisistratus, who commanded the naval force of Alexander the Great. There was a temple here dedicated to Venus.

LAPEROUSE, JOHN FRANCIS GALUPE DE, a French navigator, distinguished for talent, enterprise, and philanthropy, and memorable on account of his mysterious fate, was born at Albi, in Languedoc, in the year 1741. He received his education at the Marine School, and at an early age entered the naval service of his country. He rapidly rose to distinction, and, in 1782, when France and England were at war, he was intrusted with the command of an expedition destined for the destruction of the English settlement at Hudson's Bay. He was completely successful in his enterprise, having destroyed Fort York, and taken the English commander prisoner. Some acts of humanity which he performed on this occasion cannot be overlooked, especially in the life of an individual whose own unhappy fate must always excite our pity and regret. When on the eve of his return home, he was informed that a number of the English, to escape falling into his hands, had abandoned their habitations, and sought an asylum in the woods, where, without food or shelter, they must inevitably fall victims to the rigours of the climate. His orders were utterly to destroy the settlement; but the man prevailed over the commander, and the fugitives were abundantly supplied with provisions, arms, and ammunition. The papers of the governor of Fort York, which had fallen into his hands, were also generously returned to their owner. After the restoration of peace, France resolved on prosecuting maritime discovery; and having fitted out two vessels, the *Boussole* and the *Astrolabe*, appointed Lapérouse to the command of the expedition. It set sail from Brest on the 1st of August 1785, and after touching at the coast of Brazil, proceeded to Conception Bay in Chili, where the ships were refitted, and provisions taken on board. Lapérouse next visited Owhyhee, one of the Sandwich Islands, and then set sail for the north-west coast of America, which he reached towards the end of June 1786, and spent some time in exploring. A port was discovered, which was named Port des Françaises, and here the vessels cast anchor, after narrowly escaping shipwreck. Nothing of moment occurred during their stay at this place, except the loss of two boats, and twenty-two men, to whose memory Lapérouse, with his characteristic humanity, erected a monument, bearing an appropriate inscription. Having refitted his ships at a settlement in California, our navigator steered for China; and, in crossing the North Pacific Ocean, discovered Necker Island. Various parts of Asia were successively visited, and the straits which bear the name of Lapérouse were discovered. Towards the end of 1787, Lapérouse landed on Maouna, one of the Navigator Islands, where the commander of one of the vessels, and twelve other individuals, were massacred by the natives. The long boats were likewise destroyed by the savages, so that it was found necessary to go to Botany Bay, where the expedition arrived on the 26th of January 1788. After building new boats, and taking in supplies, Lapérouse set sail from this place in March, having previously written a letter to France, stating his intention to continue his researches till December, when, after visiting the Friendly Islands, he expected to arrive at the Isle of France. This was the last intelligence received of the fate of the expedition, and for a period of nearly forty years not the slightest trace of the course which it had taken could be found, although, in 1791, two frigates were despatched from Brest in search of it. Some years ago, however, public attention was attracted to this mysterious affair, by the publication of a work by Captain Dillon, an English commander, in which a detailed account was given of there having been found on an island of the Pacific Ocean, one of those belonging to the group called the New Hebrides, various articles which had belonged to the two vessels of Lapérouse. The facts discovered by Captain Dillon were, that the two ships struck on a reef at Maunicolo, in lat. 11. 4. S. long. 169. 20. E.; that one of them immediately went down, and most on board perished, but that the greater part of the crew of the other escaped. With the remnants of the vessels the survivors constructed a craft, in which all but two individuals put to sea; but the ill-fated bark was never more heard of. The articles brought home were various parts of a ship, as well as a few domestic utensils, on some of which were stamped the national arms of France, and on others those of private families. Viscount Lesseps, a nobleman who had left the expedition at an early period, carefully examined these relicts, and gave it as his opinion, that in all probability they belonged to the Astrolabe and Boussole. Still, however, a veil hangs over the fate of Lapérouse; and that the vessels wrecked on the island of Maunicolo were really those under his command, wants further confirmation. By the nobleman above named, Lapérouse sent home journals and papers relating to the expedition, which were published at Paris in 1797, in four vols. 4to; and they have been translated into English, and frequently printed, principally in an abridged form.

Lapidary.

LAPIDARY, an artificer who cuts precious stones. The art of cutting precious stones is of great antiquity. The French have carried it to high perfection, but they are not in any degree superior to the British. There are various machines employed in the cutting of precious stones, according to their quality. The diamond, which is extremely hard, is cut on a wheel of soft steel, turned by a mill, with diamond dust tempered with olive oil, which also serves to polish it. The oriental ruby, sapphire, and topaz, are cut on a copper wheel, with diamond dust tempered with olive oil, and are polished on another copper wheel with tripoli and water. The hyacinth, emerald, amethyst, garnets, agates, and other stones not of an equal degree of hardness with the other, are cut on a leaden wheel with smalt and water, and polished on a tin wheel with tripoli. The turquoise of the old and new rock, girasol, and opal, are cut and polished on a wooden wheel with tripoli also.

Lapidary is also used for a virtuoso skilled in the nature, kinds, and values of precious stones; or a merchant who deals in them.

Lapidary Style denotes the style proper for monumental or other inscriptions. This is a kind of medium between prose and verse; the jejune and the brilliant are here equally to be avoided. Cicero has prescribed the rules of it: *Accedat oportet oratio varia, vehemens, plena spiritus. Omnium sententiarum gravitate, omnium verborum ponderibus, est utendum.*

LAPIDESCENT, any thing which has the faculty of petrifying, or turning bodies to a stony nature. The older naturalists speak of a lapidescent principle, a lapidescent spirit, a lapidescent juice, and so on.

LAPIS, in general, is used to denote a stone of any kind or description.

Lapis, in Roman antiquity, a geographical measure denoting a mile, because miles were distinguished by erecting a stone at the end of each; from the number marked on which, the length of way to or from Rome might be known. This device is ascribed by Plutarch to Caius Gracchus; but it was more accurately executed by Augustus, who erected a gilt pillar in the forum, at which all the public ways of Italy, distinguished by stones, were terminated. The same thing was done in the Roman provinces. Hence the phrases *tertius lapis, centesimus lapis,* for three or a hundred miles; and sometimes the ordinal number, without *lapis,* as *ad duodecimum,* at twelve miles distance.

LAPITHÆ, in *Ancient Geography,* a people of Thessaly. See the next article.

LAPITHUS, in fabulous history, a son of Apollo by Stilbe. He was brother to Centaurus, and married Orsinome, daughter of Euronymus, by whom he had Phorbas and Periphas. The name of Lapithæ was given to the numerous children of Phorbas and Periphas, or rather to the inhabitants of the country of which they had obtained the sovereignty. The chief of the Lapithæ assembled to celebrate the nuptials of Perithous, one of their number. Amongst them were Theseus, Dryas, Hopleus, Mopsus, Phalerus, Exadius, Prolochus, Titaresius, and others. The Centaurs were also invited to partake of the common festivity; and the amusements would have been harmless and innocent, had not one of the intoxicated Centaurs offered violence to Hippodamia, the wife of Perithous. The Lapithæ resented the injury, and the Centaurs supported their companions; upon which the quarrel became universal, and ended in blows and slaughter. Many of the Centaurs were slain, and they were at last obliged to retire. Theseus amongst the Lapithæ showed himself brave and intrepid in supporting the cause of his friends; and Nestor also was not less active in the protection of chastity and innocence. Hesiod has described the battle of the Centaurs and Lapithæ; as has also Ovid, in a more copious manner. The invention of bits and bridles for horses is attributed to the Lapithæ.

LAPLACE, Pierre Simon, Marquis de, one of the greatest geometricians and physical astronomers that any age or country has produced, and scarcely less distinguished in the other natural sciences, was a native of Normandy, in which province he first saw the light on the 23d of March 1749. It was observed, even at the commencement of his studies, that he was endowed with a prodigious memory; and that all the ordinary occupations of the mind were to him easy. He rapidly acquired an extensive knowledge of the ancient languages, and cultivated different branches of literature. Every thing interested his rising genius, and every thing served to unfold it. His first successes were achieved in theological studies; the most difficult points of controversy he treated with extraordinary talent and sagacity.

It is not known by what fortunate accident M. de Laplace passed from the study of scholastic learning to that of the higher geometry. This last science, which scarcely admits of a divided affection, now attracted and fixed his attention. From that time, he abandoned himself without reserve to the impulse of his genius, and became sensible that a residence in the capital had become necessary to him. D'Alembert then enjoyed all the splendour of his European reputation. It was he who had just informed the court of Turin, that its academy possessed a geometrician of the first order, Lagrange, who, but for this noble testimony to his merits, would have remained long unknown. D'Alembert had announced to the king of Prussia, that there was only one man in Europe fitted to replace at Berlin the illustrious Euler, who, having been recalled by the government of Russia, had consented to return to St Petersburg. Amongst his inedited letters, Baron Fourier discovered the details of the negociation which fixed Lagrange as a resident at Berlin.

About the same time, M. de Laplace commenced that long career which was destined soon to become so illustrious. He presented himself at the house of D'Alembert, preceded by numerous recommendations, which might have been supposed to be all-powerful. But his attempts were vain; he was not even introduced. He then addressed to the man whose suffrage he had in vain solicited, a very remarkable letter on the general principles of mechanics, of which, at an after period of his life, he several times cited various fragments to his friend Baron Fourier. It was impossible that so great a geometrician as D'Alembert should not be struck with the singular profundity of this composition. The same day, he waited upon the author of the letter, and said to him, "Sir, you see that I pay little attention to recommendations; you have no need of them. You have made yourself better known; that is sufficient for me; you may command my support." A few days afterwards, he got M. de Laplace appointed professor of mathematics to the Military School of Paris. From this moment, having devoted himself exclusively to the science which he had selected, the latter gave to all his labours a fixed direction, from which he never afterwards deviated; for the imperturbable constancy of his views and steadiness of his application formed the principal characteristics of his genius. Already he had reached the known limits of the mathematical analysis; he was then master of all that was most ingenious or most powerful in that science; and no one seemed more capable than he of enlarging its domain. Having resolved a capital question of theoretical astronomy, he formed the design of consecrating his efforts to that sublime science, which he was destined to perfect, and which he alone could embrace in its full extent. He meditated deeply his glorious design; and he passed his whole life in accomplishing it, with a perseverance of which the history of the sciences scarcely presents any similar example.

The immensity of the subject flattered the just pride of his genius. He undertook to compose the *Almagest* of his age, we mean the work which he has left us under the title of *Traité de Mécanique Céleste;* a work which is as superior to that of Ptolemy, as the analytical science of the moderns surpasses the elements of Euclid. Time, which alone dispenses literary glory with justice, and which consigns to oblivion contemporary mediocrity, perpetuates the remembrance of great works. It is they only which carry to posterity the character of each age. Thus the name of M. de Laplace will live throughout all ages. But enlightened and faithful history will not separate his renown from that of the other successors of Newton. It will unite in one and the same series the illustrious names of D'Alembert, Clairaut, Euler, Lagrange, and Laplace. After Euler, Lagrange contributed most largely to found the mathematical analysis, which, in the writings of these two great geometricians, became a distinct science, the only one of the mathematical theories of which it could be said that it had been completely and rigorously demonstrated. Lagrange was born to invent and to enlarge all the sciences of calculation. If he had been the contemporary of Archimedes and of Conon, he would have shared the glory of the most memorable discoveries; and at Alexandria he would have been the rival of Diophantes.

M. de Laplace had received from nature all that force of genius which was required for an immense enterprise; and in his *Almagest* of the nineteenth century, he has not only comprised all that had previously been discovered in the mathematical and physical sciences, and which serves as the foundation of astronomy; but he added to this science capital discoveries peculiar to himself, and which had escaped all his predecessors. Either by his own methods, or by those of which Euler and Lagrange had previously indicated the principles, he resolved questions the most important, and certainly the most difficult of all those which had been considered before his time. Thus, in the motions of the moon he discovered an acceleration of which no one had previously been able to explain the cause. It had been supposed that this effect might proceed from the resistance of the ethereal medium in which the heavenly bodies revolved. But if this were so, the same cause, affecting the courses of the planets, would tend more and more to change the primitive order. These stars would be incessantly disturbed in or deflected from their orbits, and would end by precipitating themselves upon the mass of the sun; and it would be necessary for the creative power to interpose anew in order to prevent or to repair the immense confusion which the lapse of time had produced. This cosmological question was assuredly one of the greatest which the human mind could propose to itself; and it is now completely resolved. The early researches of M. de Laplace respecting the invariability of the dimensions of the solar system, and his explanation of the secular equation of the moon, conducted him to this solution.

He had at first inquired if the acceleration of the lunar movement could be explained by supposing that the action of gravity was not instantaneous, but subjected to a successive transmission, like that of light. In this way, however, he could not discover the true cause. But a new investigation, based upon a sounder principle, led him to the desired object; and, on the 19th of March 1787, he gave to the Academy of Sciences a clear and unexpected solution of this capital difficulty, proving distinctly that the acceleration observed is a necessary effect of universal gravitation. This great discovery threw new light upon the most important points in the system of the world. From it he deduced, that if the action of gravitation on the stars was not instantaneous, this principle must be propagated at least fifty million times more rapidly than light, the velocity of which is seventy thousand leagues a second. He also concluded that the medium in which the heavenly bodies revolve opposes no sensible resistance to the courses of the planets; since this cause would especially affect the motion of the moon; in which, however, it produces no observable effect. The same principle is also fertile in remarkable consequences. It follows from it, that the motion of rotation of the earth on its own axis is invariable. The duration of the day has not changed the hundredth part of a second during two thousand years. The distance of the sun from the earth may also be deduced with certainty from the assiduous observation of the lunar motions. But the most striking consequence, perhaps, is that which relates to the figure of the earth, the form of which is imprinted in certain inequalities in the course of the moon, which could not have taken place if the earth had been perfectly spherical. The quantity of the terrestrial oblateness may be determined from the lunar movements alone; and the results which have been deduced from these agree with the actual measures which have been obtained from geodesical operations at the equator, in the northern regions of Europe, in India, and in various other countries.

"The explanation of the moon's acceleration," says Professor Playfair, in his masterly and eloquent review of the *Système du Monde*, "and the proof that it is not constantly increasing, but merely a periodical inequality, is a great step in the philosophy of the heavens. The continual increase of the moon's angular velocity, which this phenomenon seemed to indicate, argued a constant diminution of her distance from the earth, and gave some countenance to the notion that the planetary orbits were continually diminishing, and that there was, amongst the bodies of our system, a tendency to descend to the centre of gravity of the whole, where their union must finally terminate the present order of nature. To this catastrophe an elegant and philosophic poet has beautifully alluded.

> Roll on, ye stars, exult in youthful prime,
> Mark with bright curves the printless steps of time;
> Near and more near your beamy cars approach,
> And lessening orbs on lessening orbs encroach.
> Flowers of the sky! ye too to age must yield,
> Frail as your silken sisters of the field!
> Star after star from heaven's high arch shall rush,
> Suns sink on suns, and systems systems crush;
> Headlong, extinct, to one dark centre fall,
> And death, and night, and chaos mingle all:
> Till o'er the wreck, emerging from the storm,
> Immortal Nature lifts her changeful form;
> Mounts from her funeral pyre on wings of flame,
> And soars and shines another and the same.[1]

The destiny of nature is, however, more noble than that which this magnificent description holds up to the fancy; and the algebraist has extracted from his calculus a more sublime conclusion than the invention of a poet has been able to attain. The constancy of nature, amidst all the changes she undergoes, is upheld by the constitution of those changes, which prescribes to each its limits, and forces it to recur in a series, which in time reduces to nothing the sum of all the deviations from the mean. Thus, the amount of the whole is permanent, though the terms themselves are perpetually changing; and hence nature is rendered immortal, not by emerging from the storm, but by being ever superior to its power; its order is not renovated, but preserved; and the wisdom of its Author has provided an antidote to evil, that renders all remedies unnecessary."[2]

We cannot undertake to indicate here the continuation of his labours, and the discoveries which resulted from them. The bare enumeration, however rapid, would exceed the limits prescribed to us. Besides his researches on the secular equation of the moon, and the discovery, not less important and difficult, of the cause of the great inequalities of Jupiter and of Saturn, we would require to cite his admirable theorems on the libration of the satellites of

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[1] Darwin's *Botanic Garden*, cant. iv. p. 1.

[2] *Edinburgh Review*, vol. xv. pp. 411, 412.

Jupiter, to recall his analytical labours on the flux and reflux of the sea, and to show the immense extent which he has given to that question. In fact, there was no point of importance in physical astronomy which he did not make the object of profound study and discussion; and he subjected to calculation the greater part of the physical conditions which his predecessors had omitted. In the question, already so complex, of the form and the motion of rotation of the earth, he considered the effect of the presence of the waters distributed between the continents of land, the compression of the interior strata, and the secular diminution of the dimensions of the globe. Amongst these researches may also be remarked those which relate to the stability of the grand phenomena of nature. No subject can possibly be more worthy the attention of philosophers. Thus, it has been ascertained that the causes, whether fortuitous or constant, which disturb the equilibrium of the seas, are subjected to limits which cannot be passed. The specific gravity of the waters being much less than that of the solid earth, it follows that the oscillations of the ocean are always included within very narrow limits, which would not happen if the liquid diffused over the globe was much more heavy. In general, nature keeps in reserve conservative forces, which, being always present, act as soon as the disturbance commences, and with a vigour proportioned to the alteration, until the accustomed order has been re-established. In the primitive and liquid state of the terrestrial globe, the heaviest substances must, by their own weight, have approached nearest the centre; and this condition has determined the stability of the seas.

Whatever may be the physical cause of the formation of the planets, it has impressed upon all these bodies a motion of projection in the same direction around an immense globe; and by this motion the solar system has become stable. The same effect is produced in the system of the satellites and the rings. In these, order is also maintained by the power of the central mass. It is not, then, as Newton and Euler had both suspected, an adventitious force, which might one day repair or prevent the disturbance caused by time. It is the law of gravitation itself; a law which regulates all, is sufficient for all, and maintains variety and order amongst all. Having once emanated from the supreme wisdom, it has presided since the origin of time, and rendered all disorder impossible. Newton and Euler did not know all the perfections of the universe. In general, as often as any doubt has arisen in regard to the universality of the Newtonian law, and the accession of some new cause has been proposed to explain apparent irregularities, it has always happened that, after a profound investigation, the primordial law has been verified. It now explains all the known phenomena. The more precise observations have become, the more conformable they are found to be to the theory of gravitation. Of all geometricians, M. de Laplace is the one who has most profoundly investigated these great questions, which, if we may so express it, he has also terminated. It cannot indeed be affirmed that it was given to him to create an entirely new science, like Archimedes and Galileo; or to give to mathematical doctrines original principles and an immense extent, like Descartes, Newton, and Leibnitz; or, like Newton, to be the first to transport to the heavens, and extend throughout the whole universe, the terrestrial dynamics of Galileo. But, to use the words of Baron Fourier, M. de Laplace was born "pour tout perfectionner, pour tout approfondir, pour reculer toutes les limites, pour résoudre ce que l'on aurait pu croire insoluble." He would have completed the science of the heavens, if that science could have been completed.

Professor Playfair thus sums up his analysis of the great work of Laplace, the *Traité de Mécanique Céleste*, wherein the discoveries which had first been communicated by the author, in the Memoirs of the Academy of Sciences, are brought together into one view, and the general results deduced from them by one uniform method of investigation.

"Such is the work of Laplace," says he, "affording an example, which is yet solitary in the history of human knowledge, of a theory entirely complete; one that has not only accounted for all the phenomena that were known, but that has discovered many before unknown, which observation has since recognised. In this theory, not only the elliptic motion of the planets, relatively to the sun, but the irregularities produced by their mutual action, whether of the primary on the primary, of the primary on the secondary, or of the secondary on one another, are all deduced from the principle of gravitation, that mysterious power, which unites the most distant regions of space, and the most remote periods of duration. To this we must add the great truths brought into view and fully demonstrated, by tracing the action of the same power through all its mazes:—That all the inequalities in our system are periodical; that, by a fixed appointment in nature, they are each destined to revolve in the same order, and between the same limits; that the mean distances of the planets from the sun, and the time of their revolutions round that body, are susceptible of no change whatsoever; that our system is thus secured against natural decay,—order and regularity preserved in the midst of so many disturbing causes,—and anarchy and misrule eternally proscribed.

"The work where this sublime picture is delineated, does honour, not to the author only, but to the human race; and marks, undoubtedly, the highest point to which man has yet ascended in the scale of intellectual attainment. The glory, therefore, of having produced this work, belongs, not to the author alone, but must be shared, in various proportions, among the philosophers and mathematicians of all ages. Their efforts, from the age of Euclid and Archimedes, to the time of Newton and Laplace, have all been required to the accomplishment of this great object; they have been all necessary to form one man for the author, and a few for the readers, of the work before us. Every mathematician who has extended the bounds of his science; every astronomer who has added to the number of facts, and the accuracy of observation; every artist who has improved the construction of the instruments of astronomy,—all have co-operated in preparing a state of knowledge in which such a book could exist, and in which its merit could be appreciated. They have collected the materials, sharpened the tools, or constructed the engines employed in the great edifice, founded by Newton, and completed by Laplace.

"In this estimate we detract nothing from the merit of the author himself; his originality, his invention, and comprehensive views, are above all praise; nor can any man boast of a higher honour, than that the Genius of the human race is the only rival of his fame."[1]

The same general character is exemplified in his researches on the analysis of probabilities; a science altogether modern, but of immense extent, and one the applications of which will one day embrace the whole range of human knowledge, forming a happy supplement to the imperfection of our nature. The doctrine of probabilities owes its origin to a single glance of the intuitive and fertile genius of Pascal; and it was from the first cultivated by Fermat and Huygens. A geometrician and philosopher, James Bernoulli, was its principal founder. A singularly happy discovery of Stirling, the researches of Euler, and, above all, an ingenious and important application made by Lagrange, improved this doctrine; whilst new light was shed upon it by the objections of D'Alembert, and by the philosophical views of Condorcet. But it was reserved for M. de Laplace to collect and to fix its principles. In his hands it became a new science, subjected to a single analytical method, and of prodigious extent. Fertile in useful applications, this science will one day serve to illustrate all the branches of natural philosophy.[1]

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[1] *Edinburgh Review*, vol. xi. pp. 277, 278.

After what has been said of these brilliant discoveries, it is scarcely necessary to add, that M. de Laplace was a member of all the learned academies of Europe. He was also invested with high political dignities. After the 18th Brumaire, the First Consul appointed him minister of the interior; but in this office, it appears, he gave little satisfaction. "A geometrician of the first class," says Napoleon, "he did not reach mediocrity as a statesman. From the first, the consuls became sensible they had made a mistake in the appointment. He never viewed any subject in a true light; he was always occupied with subtleties; his notions were all problematic; and he carried the spirit of the *infiniment pétit* into the administration." Accordingly, at the end of six weeks, he surrendered to Lucien Bonaparte the portefeuille of his office. But he was created a senator, then made vice-chancellor, and at length chancellor of the conservative senate, and at the same time a member of the legion of honour. In 1805, he presented a report to the senate, in which he proved the necessity of restoring the Gregorian calendar, and abolishing that of the republic. In 1814, he voted for the abdication of Napoleon, an act which reflects no great honour on his memory. During the Hundred Days he did not make his appearance at the Tuilleries, apprehensive, no doubt, of being reproached with tergiversation and ingratitude. Soon after the restoration, he was created a peer of France with the title of Marquis; an honour for which he was more indebted, perhaps, to the vote he had given in 1814, than to all his eminence in science. But the immortal author of the *Mécanique Céleste* required none of those arbitrary and adventitious distinctions, which are so often the reward of political subserviency. His genius and his fame were incapable of receiving any secondary or reflected illustration. The only points of real importance in his life are the eternal truths which he discovered, not the dignities with which he was invested; the immutable laws of the stability of the world which he unfolded, not the rank which he for several years held in the senate called conservative; and the example which he has left to all those who cultivate the sciences of patient thinking and incomparable perseverance.

M. de Laplace enjoyed an advantage which fortune does not always afford to great men. From his early youth, his merits were fully appreciated by his illustrious friends. D'Alembert, as we have seen, lost no time in introducing him to the Military School of France, and in providing for him, had it been necessary, a better establishment at Berlin. The President Bochard de Saron caused to be printed, at his own expense, the early works of Laplace. All the testimonies of friendship which were given him recall great labours and great discoveries; but nothing could contribute more to the progress of physical knowledge than his relations with the illustrious Lavoisier, whose name, hallowed in the history of the sciences, has become an object of eternal respect and sorrow. These two celebrated men combined their efforts for the advancement of science. They undertook and completed extensive researches, in order to measure one of the most important elements of the physical theory of heat. They made also, about the same time, a long series of experiments on the dilatations of solid substances. The works of Newton show the importance which that great geometrician attached to the special study of the physical sciences. Of all his successors, M. de Laplace is the one who has made most of his experimental method; he was almost as great a natural philosopher as a geometrician. His researches on refraction, capillary attraction, barometrical measurements, the statical properties of electricity, the propagation of sound, molecular action, and the properties of gas, prove that every thing connected with the investigation of nature was familiar to him. He desired above all things the perfection of instruments, and caused to be constructed, at his own expense, by a celebrated artist, a valuable astronomical instrument, which he presented to the Observatory of France.

All sorts of phenomena were perfectly known to him. He was connected by ancient friendship with two natural philosophers, whose discoveries have thrown light upon all the arts and all the chemical theories. History will associate the names of Berthollet and of Chaptal with that of M. de Laplace. He took pleasure in meeting them together, and the conversations which then ensued had all for their object the advancement of science. The gardens of Berthollet at his house at Arcueil were contiguous to those of M. de Laplace. Interesting recollections and great regrets have illustrated this locality. It was there that Laplace received celebrated foreigners, and men in power, from whom science had received, or hoped to receive, benefits, but, above all, those whom a sincere zeal had attached to the sanctuary of the sciences. He received all with extreme politeness—those who were just commencing their career, as well as the veterans who were soon to finish it; and he carried this so far, that persons who did not know the full extent of his genius would perhaps have supposed that he derived some advantage from their conversation.

In referring to the mathematical works of M. de Laplace, we have particularly noticed the depth of his researches and the importance of his discoveries. But these works are distinguished by another quality, which all readers have appreciated, we mean the literary merit of the composition. The *Système du Monde*, in particular, is remarkable for the elegant simplicity of the style and the purity of the language. There had hitherto been no example of a work of this kind; but it would be a mistake to suppose that a real knowledge of the phenomena of the heavens can be acquired from such writings. The suppression of the signs peculiar to the language of the calculus cannot conduce to clearness, or render the perusal more easy. The work is a perfectly regular exposition of the results of profound study; it is an ingenious and admirable summary of the principal discoveries. The precision of the style, the choice of the methods, the grandeur of the subject, give a singular interest to this vast picture; but its real utility consists in recalling to geometricians the theorems, the demonstrations of which were previously known to them. "C'est, à proprement parler," says M. Fourier, "une table de matières d'un traité mathématique." The purely historical works of Laplace have another object. He therein presents to geometers, with admirable talent, the progress of the human mind in the invention of the sciences. The most abstract theories have, in fact, a beauty of expression which is peculiar to them. This is what may be observed in several treatises of Descartes, and in some pages of Galileo, of Newton, and of Lagrange. The novelty of the views, the elevation of the thoughts, and their relation to the great objects of nature, attach and occupy the mind. It is sufficient that the style be pure, and of a noble simplicity. It is this species of literature which M. de Laplace selected; and it is certain that he placed himself in its first rank. If he writes the history of great astronomical discoveries, he becomes a model of elegance and precision. No leading feature of the subject ever escapes him, and the expression is never either ambitious or obscure. Every thing that he calls great is in fact great; whatever he omits does not deserve to be mentioned.

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[1] See an admirable account of the *Essai Philosophique sur les Probabilités* (which is only an abstract of the large work by the same author, entitled *Théorie Analytique des Probabilités*, Paris, 1812), in the *Edinburgh Review*, vol. xxiii. p. 320, *et seqq.* and which is known to have proceeded from the pen of Professor Playfair.

M. de Laplace retained at a very advanced age that extraordinary memory for which he had been so remarkable from his earliest years; a precious endowment, which, though not genius itself, enables genius to acquire and to preserve. He had not cultivated the fine arts, but he appreciated them. He loved the music of Italy and the verses of Racine; and he often amused himself in reciting from memory various passages of that great poet. The compositions of Raffaelle adorned his apartments. Beside them were the portraits of Descartes, Vieta, Newton, Galileo, and Euler. M. de Laplace had always accustomed himself to a light diet, which he diminished more and more even to excess. His very delicate sight required continual precautions, and he succeeded in preserving it without any alteration. His care of himself had never any other object than that of reserving all his time and all his powers for the labours of the mind. He lived for the sciences, and the sciences in return have rendered his memory immortal.

At the commencement of the malady which ultimately carried him off, his friends observed with dismay an instant of delirium. But even in that state the sciences still occupied him. He spoke with unusual ardour of the motion of the stars, and then of an experiment in physics, which he declared to be a capital one; announcing to the persons he believed to be present, that he would soon communicate these questions to the Academy. Meanwhile his strength rapidly declined. His physician, Majendie, who merited all his confidence by superior talents, and by those attentions which friendship alone could inspire, watched beside his bed. M. Bouvard, his fellow-labourer and friend, never quitted him for an instant. The persons who attended him at his last moments recalled the titles of his glory, and spoke of his most splendid discoveries. "What we do know," replied the dying man, "is a small matter; what we do not know is immense." This is all that could be collected; these were the last articulate expressions that dropped from his lips. He soon afterwards expired without pain; the powerful genius which had so long animated him separated itself from its mortal habitation, and returned to the God who gave it. He died on the 5th of March 1827, in the seventy-eighth year of his age.

The successors of this great man will see accomplished the phenomena, the laws of which he discovered. They will observe in the lunar motions the changes which he has predicted, and of which he alone could assign the cause. The continual observation of the satellites of Jupiter will perpetuate the memory of the inventor of the theorems which express the laws according to which their courses are regulated. The great inequalities of Jupiter and of Saturn, pursuing their long periods, and giving to these planetary stars new situations, will incessantly recall one of his most astonishing discoveries. These are the titles of a true glory, which nothing can ever destroy. The spectacle of the heavens will be changed; but, at the remote epoch when this shall occur, the glory of the discoverer will remain unchanged. The traces of his genius bear the stamp of immortality.

The following list of the works of M. de Laplace, for which we are chiefly indebted to *La France Littéraire* by M. Quérard, includes not only the titles of his different publications which appeared in a separate form, but also those of the numerous memoirs with which, during a period extending to rather more than half a century, he enriched the collections of the Academy and the Institute, and the Journal of the Polytechnic School:—

1. *Essai Philòsophique sur les Probabilités*, Paris, 1814, in 4to. Another edition of this work was published the same year in 8vo, and the work was reprinted in 1816, 1819, and 1825. The *Essai Philosophique* is merely an abstract of the large work on the same subject.

2. *Exposition du Système du Monde*, in five books, the fifth edition, revised and augmented by the author, Paris, 1824, in 4to, and in two vols. 8vo. The first edition of this work appeared in 1796, in two vols. 8vo. In five books the author treats, 1st, of the apparent motions of the heavenly bodies; 2d, of the real motions of those bodies; 3d, of the laws of their motions; and, 4th, of the theory of universal gravitation. The fifth book contains an abridgment of the history of astronomy.

3. *Précis de l'Histoire de l'Astronomie*, Paris, 1821, in 8vo. This is merely the fifth book of the fifth edition of the *Exposition du Système du Monde*, published separately.

4. *Théorie Analytique des Probabilités*, third edition, revised and augmented by the author. The first edition of this work appeared in 1812, in 4to. From 1816 to 1825 M. de Laplace published four supplements, which the publisher, after having sold them for some years separately, added to the volume to which they now serve as a complement. These supplements treat, 1st, of the application of the calculus of probabilities to natural philosophy; 2d, of the application of the calculus of probabilities to geodesical operations; and, 3d, of the application of geodesical formulæ of probability to the meridian of France. The fourth contains an abridgment of the theory of probabilities.

5. *Théorie des Attractions Sphéroïdes, et de la Figure des Planètes*, Paris, 1785, in 4to. This is a memoir extracted from the collection of the Academy of Sciences.

6. *Théorie du Mouvement et de la Figure elliptique des Planètes*, Paris, 1784, in 4to. This work was printed at the expense of President Bochard de Saron, who only caused two hundred copies to be struck off, for the purpose of being distributed gratuitously.

7. *Traité de Mécanique Céleste*, in sixteen books, Paris, 1799–1825, in five vols. 4to, with four supplements published at different times. The first book treats of the general laws of the equilibrium of motion; the second, of the law of universal gravitation, and the motion of the centres of gravity of the heavenly bodies; the third, of the figure of the heavenly bodies; the fourth, of the oscillations of the sea and the atmosphere; the fifth, of the motions of the heavenly bodies around their proper centres of gravity; the sixth, of the theory of the planetary motions; the seventh, of the theory of the moon; the eighth, of the theory of the satellites of Jupiter, Saturn, and Uranus; the ninth, of the theory of comets; the tenth, on different points relative to the system of the world; the eleventh, on the figure and rotation of the earth; the twelfth, on the attraction and repulsion of spheres, and the laws of the equilibrium and motion of elastic fluids; the thirteenth, on the oscillation of the fluids which cover the planets; the fourteenth, on the motions of the heavenly bodies around their centres of gravity; the fifteenth, on the motions of the planets and the comets; and the sixteenth, on the motions of the satellites. A second edition of the first two volumes of this work was published at Paris in 1829, 1830. In this country no attempt has yet been made, so far as we know, to translate the *Traité de Mécanique Céleste* into English; but, in 1830, an English translation of the first volume, with a commentary, was published at Boston in the United States of America. Both the translation and

the commentary are by Dr Bowditch of Boston; but the amount of the latter is out of all proportion to the text, being intended to enable persons but moderately skilled in the mathematics to comprehend the profound analytical investigations of the great astronomer, and to follow him to his beautiful and striking results.

8. Besides the works which we have just enumerated, M. de Laplace is also the author of a series of very important Memoirs, in which, from 1772 to 1823, he published the collections of the old and the new Academy of Sciences, that of the Institute, and the Journal of the Polytechnic School. The subjects of these Memoirs are exceedingly various. We give the following list in the chronological order of their impression, viz. 1. On the Particular Solutions of Differential Equations, and on the Secular Inequalities of the Planets, 1772; 2. On the Integral Calculus, and on the System of the World, 1772; 3. On the Integral Calculus of Partial Differences, 1773; 4. On recurring Series, and their Uses in the Theory of Chances, 1774; 5. On the Probability of Causes afforded by Events, 1774; 6. On some Points in the System of the World, 1775 and 1776; 7. On the Integration of Differential Equations with Finite Differences, 1776; 8. On the mean Inclination of the Orbits of Comets, id.; 9. On the Use of the Calculus of Partial Differences in the Theory of recurring Series, 1777; 10. On the Precession of the Equinoxes, id.; 11. On the Integration of Differential Equations by Approximation, id.; 12. On Probabilities, 1778; 13. On Series, 1779; 14. On the Determination of the Orbits of Comets, id.; 15. On Heat, id.; 16. On the Electricity which Bodies absorb when reduced to Vapour, 1781; 17. On the Approximations of Formulæ which are functions of very great numbers, 1782, 1783; 18. On the Figure of the Earth, 1783; 19. On the Births, Marriages, and Deaths at Paris from 1772 to 1784; 20. On the Population of France, and the Number of Inhabitants in the Country, 1783–1788; 21. On the Secular Inequalities of the Planets and of the Satellites, 1784; 22. Theory of Jupiter and of Saturn, 1787; 23. On the Secular Equation of the Moon, 1786; 24. On the Theory of Saturn's Ring, 1787; 25. On the Secular Variations in the Orbits of the Planets, id.; 26. Theory of the Satellites of Jupiter, 1788, 1789; 27. On the Theory of the Satellites of Jupiter, 1789; 28. On the Flux and Reflux of the Sea, 1790; 29. On the Determination of a Plane which remains always parallel to itself, in the movement of a system of bodies acting upon each other in any manner whatsoever, and free from all foreign action, 1798; 30. On Mechanics, id.; 31. On the Motions of the Heavenly Bodies round their Centres of Gravity, id.; 32. On the Secular Equations of the Motions of the Moon, of her Apogee, and of her Nodes, 1799; 33. On the Motion of the orbits of the Satellites of Saturn and Uranus, 1801; 34. On the Theory of the Moon, id.; 35. On Different Points of Analysis, 1809; 36. On the Motion of Light in Diaphanous Media, id.; 37. On the Approximations of the Formulæ which are functions of very great numbers, and on their application to Probabilities, id.; 38. On the Figure of the Earth, 1817; 39. On the Flux and Reflux of the Sea, 1818; 40. Addition to the Memoir on the Figure of the Earth, id.; 41. On the Developments of the true Anomaly, and of the Elliptical Radius Vector, in series arranged according to the powers of the eccentricity, 1823. Lastly, the Marquis de Laplace contributed, in the mathematical department, to the *Leçons de l'Ecole Normale.*

(See *Eloge Historique de M. le Marquis de Laplace*, by Baron Fourier, in the *Mémoires de l'Académie Royal des Sciences de l'Institut de la France*, tom. x. p. lxxxi.; Quérard, *La France Littéraire*, art. LAPLACE; *Revue Encyclopédique*, tom. xxxiii. p. 880; *Edinburgh Review*, vol. xi. p. 249, et seqq. vol. xv. p. 396, et seqq. and vol. xxiii. p. 320, containing masterly criticisms on the *Mécanique Céleste*, the *Exposition du Systême du Monde*, and the *Essai Philosophique sur les Probabilités;* and Dissertations Third and Fourth, prefixed to the present work.) (A.)

LAPLAND, the most northerly country of Europe, is bounded on the north by the Arctic Ocean, on the south by Sweden, on the east by the White Sea, and on the west by Norway and the Atlantic Ocean. Its limits are not very accurately laid down by travellers or geographers; but it seems to be divided from the rest of Scandinavia by a line nearly corresponding with the polar circle, in latitude 66. 32. and is consequently almost entirely an arctic region. North Cape, its most northerly point, is situated in latitude 71. 10. 15. consequently its length from north to south is about 330 miles, and not 500, as is usually stated. From Cape Orlov, on the White Sea, to the Atlantic on the west, it extends about 700 miles; but, besides this continental territory, there are a vast number of islands which are included in the general name of Lapland. The whole country is divided into three parts, called Russian, Swedish, and Norwegian Lapland or Finmark, and is recognised by the Swedes and Norwegians by the name of Lapmark, *mark* signifying, both in Swedish and Norse, land or tract of country. The very early writers, however, do not notice any country under the name of Lapmark, whilst Finmark is alluded to, though not with such clearness as would admit of our defining the exact extent of country which went by that appellation. It has been conjectured that, in former ages, the parts of the north now known by the names of Swedish and Russian Lapland, were distinguished as Russian and Swedish Finmark, previously to the period when the Finns obtained the name of Lapper or Laplanders. Throughout Norway and Finmark they are uniformly termed Finns, which was their ancient and most proper designation; it is only in Sweden, and Swedish and Russian Lapland, that the name of Lap is given to the inhabitants of the country. They were called Lappes by Laxo in the twelfth century; but still the etymology of the word is thus very obscure, though circumstances seem to favour the supposition that the term Lap was applied to this race of people by their neighbours the Swedes, and hence was transferred to the country which they inhabited. In the old Russian annals they are always styled *Lepori*, a word most probably of Finnic origin. Finmark, which forms the most northern part of this wild and extensive territory, constitutes one extremity of the kingdom of Norway, to which it now belongs; though doubtless in ancient times it was a separate kingdom, governed by its own sovereigns. Its present boundary on the west is Loppen, the first island in Finmark, and which forms a line between it and the Nordlands, a part of Norway sometimes erroneously confounded with Lapland. On the north-west and north-east it is washed by the Polar Ocean, whilst to the east it is bordered by Russian Lapland, which also, with Nordland, bounds it to the south; the boundary line between the two countries being the river Tana. Its extent from north to south, that is, from the borders of Russian Lapland to the North Cape, is nearly three degrees of latitude; its greatest breadth being from west to east, namely, from the western side of Faroe to the coast above Waranger, near the borders of Russian Lapland. At the eastern extremity of Finmark there is a considerable tract, to which both Norway and Russia lay claim. It lies between the acknowledged boundaries of each of these powers, and being now considered as neutral ground, is free to the Laplander of both countries to hunt and fish in. This district extends a little to the westward of Bugefiord, stretching nearly south to the Enara Lake, where it bends to the east, and afterwards to the north-east, where it joins the coast. Russian Lapland lies to the south and east of the debateable ground above mentioned. The river Muonio, which for a considerable portion of its early course receives the name of the Köngärnäelf, constitutes the boundary between Sweden and Russia. The circle of Kola, and the northern part of Eastern Kemi, constituted at one time Russian Lapland; but, by subsequent treaties, two extensive districts, all the Lapmark of Western Kemi, and the greater part of the Lapmark of Torneo, have been ceded to Russia. Thus nearly two thirds of the regions inhabited by the Laplanders are included in the dominions of the emperor of Russia. Swedish Lapland, the most southerly division, occupies the interior part of the country to the west of the river Torneo; the maritime district of Nordland, a portion of Norway, being situated between it and the North Sea. How much of the northern part of Sweden is entitled to be called Swedish Lapland, it is impossible to say. If the arctic circle be taken as the boundary line, only that portion of Sweden called North Bothnia can be considered as belonging to Lapland; but Pitea Lapmark and Umea Lapmark are sometimes mentioned as forming part of the latter country, and these are situated in West Bothnia. The cause of error may be traced to the circumstance of these nomadic tribes frequently inhabiting, at least for a portion of the year, districts of country far down in the interior of Sweden and Norway. Thus, in the latter country, the Roraas Mountains, situated between Christiania and Drontheim, are inhabited, during summer at least, by a family of Laplanders, with the never-failing herd of rein-deer. But the exact boundary line is not very material, as it has reference only to different portions of a tract of country which is under one government.

Mountains.

Lapland is not intersected by alps or very high mountains, as is sometimes asserted; but, from Nordland onwards, the whole region is a table-land, crowned only on its western frontier with a mountainous chain, which forms the extremity of the Scandinavian Alps, and descends from Sulitelma, of which the elevation is 6760 feet, to the height of Norwegian Finmark. These are about 3600 feet high on the continental coast, and nearly 4000 on some islands. The sea-coast presents a remarkably bold and rugged, if not magnificent appearance. Mountain is seen piled on mountain in stern grandeur, and white with the snows of ages; and the sublimity of the scene is enhanced by the myriads of islands which are scattered in an extraordinary manner along the Norwegian and Lapland coast, as far as North Cape. Ravines and valleys intersect the interior; the elevation of the highest plains has been estimated at about sixteen hundred feet, but towards the east and the south they descend. Rocks and hills rise from the table-land, varying, to the east of 18° west longitude, from 2000 to 2400 feet above the level of the sea, but only from 500 to 600 feet above their base. These hills are rather isolated groups than a continuous chain; and at twenty leagues to the south of them the streams and rivers separate in different directions between the North Sea and the Bothnian Gulf, and between the Gulfs of Alten and Torneo. The central ridge is supposed to descend without interruption to the entrance of the White Sea, and that part of Lapland consists of extensive marshes, studded with rocks. These have been called the Koelin Mountains, and, strictly speaking, may be said to form one great chain; but the branches which it casts off to the right and to the left, the mountainous isles of Lofoden, which are merely the summits of some of its branches, and the mountains which terminate near Lake Enara in Russian Lapland, entitle it to the name of a group. Other ranges of hills, which traverse Lapland, and are connected with Finland, are lost round the numerous lakes in that country. Sulitelma, already mentioned, is the highest mountain in Lapland. The islands of Waag and Hurd have each heights rising 4264 feet above the level of the sea; and a glacier on the island of Seyland is 4155 feet high. The mineralogical structure of the Lapland Mountains has not been thoroughly ascertained. M. de Buch informs us that the hills which he examined on the higher part of the table-land are composed of granite and gneiss. The latter rock is said to be by far the most abundant in Scandinavia, all the other primitive rocks appearing in some degree subordinate to it. Quartz is very abundant on the island of Mageröe. On the Dovrefield, and other mountains, it is met with in scattered blocks; but at the North Cape the surface of the ground is wholly covered with it. M. de Buch also observed, in an excursion which he made towards the Gulf of Bothnia, a succession of calcareous and schistose rocks. These substances likewise abound in the country between the last-named gulf and that of Kandala. The land is intersected with ravines, but its elevation is inconsiderable. The whole region is supposed to rest on a base of red *decomposable* granite, or, as it is generally called by the natives, *rapakivi.* There is abundance of metal found in Lapland, particularly iron, of which whole mountains exist in that part of the country belonging to Sweden. Copper, lead, zinc, silver, and even traces of gold, have been found; but iron ore is the chief mineral treasure of the country, and might assist in introducing cultivation and an extensive trade into this desert portion of Europe, did not the scarcity of timber, and the great difficulty of conveying goods, constitute insuperable obstacles to the working of the mines in the inland and eastern parts of the country, where it would appear to be most abundant. The marshy lands are impregnated with this valuable metal, and in gneiss it occurs in beds which are sometimes nearly forty feet in thickness. Numerous minerals are found in Lapland; rock crystal in particular is very common, and the inhabitants occasionally dispose of it for amethysts and topazes.

Lakes and rivers.

There are numerous lakes and rivers in Lapland. Of the latter, several take their rise in the Koelin Mountains, and flow in various directions into the Atlantic Ocean or the Gulf of Bothnia. The principal rivers of the country are the Tana or Tarna, which takes a north-eastern course through Finmark, and empties itself into a bay or sound of the same name; the Alten or Alata, which is very rapid, forcing its way through the mountains of Finmark in a north-westerly direction, empties itself into a bay of the same name; the Torneo, which issues from a lake so named, and, after being enlarged by a number of streams uniting in one channel and running nearly due south through a long course, falls into the northern extremity of the Bothnian Gulf at Torneo; and the Muonio, which rises from the Killpis Jaure, at the foot of the alpine chain of Norway, is a considerable stream, and constitutes the boundary line between Sweden and Russia, till it unites with the river Torneo, when the latter marks the limits of either country in this quarter. There are also other rivers which take their rise in Lapland, and fall into the Gulf of Bothnia, such as the Lulea, Pitea, Kalix, and others. In Russian Lapland there are several considerable streams, but these have not been so well defined, nor has this part of Lapland been so fully described, as the others. The Kemi takes its rise amongst the Kemi Mountains, situated near the centre of the country, and flows into the Gulf of Bothnia. It has many imposing cataracts, of which the *Taival Koski*, or the fall of the heavens, is the only one which the adventurous boatmen never attempt to cross. The *Passe*, or holy stream, is the outlet of the great lake Enara, flowing thence to the Arctic Ocean. The eastern declivities of Russian Lapland are watered by the Panoi, which discharges itself into the White Sea. The Tuloma falls from a great height, enters the lake Kola, which name it afterwards takes, and falls into Kola Bay, on the Arctic Ocean. Besides these, there are numerous other rivers which traverse the country in various directions, and either give rise to lakes, or issue from them. The abundance of lakes is the most prominent feature of Lapland, as it generally is of all countries situated in such latitudes. Sometimes these sheets of water occur singly, sometimes in chains, and many of them are of considerable size; but there exists such a confusion of nomenclature, that it is difficult to distinguish one from another, and apply to each its proper designation.[1] Very often the rivers, such as the Muonio, become so broad in some parts, as often to assume the appearance of lakes, and there is little doubt they have occasionally been so termed. The most considerable lakes are, the Enara, in Russian Lapland, which is about forty miles in length by sixteen in breadth; the Imandra, which has an elevation of four hundred feet above the level of the sea, and is discharged into the Gulf of Kandala; the Biggi Lobee, and Biggi Jaure, one or other of which, Sir Capel Brooke supposes, is that designated by Von Buch the Jess Jaure; and many others which do not require to be enumerated. Besides these inland bodies of water, the shores are indented by extensive *fiords* or arms of the sea, which frequently run thirty, or even forty miles into the heart of the country.

Finmark and Swedish Lapland, including all the modern provinces belonging to Russia, have been carefully examined by Wahlenberg and De Buch, and the vegetable kingdom distinguished into six zones, concentric with the Gulf of Bothnia, each differing from the others in climate and productions. The first or lower region of the forests rises from the level of the sea to the height of five hundred feet, forming a zone generally eighty miles in breadth; and here the spruce and Scotch fir abound. The second is higher and colder than the first, rising from five hundred to eight hundred feet, and being generally only from six to eight miles in breadth. This portion has been denominated the upper region of the forests, and here the Scotch fir is still found, but the other plants disappear. The third is higher than any of the preceding, rising from 800 to 1200 feet, and for the most part about twelve miles in breadth, excepting at one place, where this becomes very great. The fir here is rarely seen, but pines are abundant. The fourth or subalpine region, rising from 1200 to 1800 feet, is a zone of about the same dimensions as the preceding, and contains birch, but coniferous trees do not grow there. The fifth is called the alpine region, or the country of the dwarf birch; and the sixth, which is the highest and most northern of all, varies in breadth according as it is indented by the sea. It is the region of perpetual congelation and eternal snow, producing no trees, and scarcely any vegetation whatever. The vegetable scale in Norwegian Lapland has been marked by Von Buch. The following table is intended for seventy degrees of north latitude:—Limit of the red pines, 730 feet; of the birch, 1483; of the *vaccinium myrtillus*, 1908; of the dwarf birch, 2576; of the *salix myrsinites*, 2908; of the *salix lanata*, 3100; and of perpetual snow, 3300. The species of plants which constitute the *Flora Laponica* are not numerous, but they abound in individuals, and the vegetation here is decidedly superior to that of the other countries round the Frozen Ocean. Mosses and lichens cover the plains and rocks which are elevated more than a thousand feet; and were the inhabitants more industrious, these might be rendered useful as dye-stuffs. The rein-deer's lichen is of a bright yellow colour, which, however, is fugitive, the yellow giving place to white as the plant dries or withers. The mosses and lichens constitute the food of the cattle, and from a species of the latter a wholesome and nutritious flour is extracted. The rocky country is the region of these cryptogamia. The *rubus chamœmorus*, and the *vaccinium myrtillus*, occur in the neighbourhood of the extensive marshes; but reeds or aquatic plants are found on the banks of lakes or rivers. A plain surrounded by rocks, and covered with moss and other alpine herbage, forms a Lapland meadow. Rein-deer moss is quite indispensable to the Laplander's herd. It is hardly to be met with on the Finmark coast, but on the continent it is found in abundance, though not so plentifully as in the interior parts. It thrives best in a flat extent of low ground, consisting of morass or forest well saturated with moisture. On this account Finmark, which is rocky and mountainous, does not abound so greatly in this moss as the level plains and morasses of Russian Lapland, where it grows in the greatest profusion, immense tracts of country being wholly covered with it. Of trees, twenty-six kinds have been enumerated, including the *salices*. There are no less than nineteen species of willows; the others consist of Scotch and spruce fir, birch, alder, poplar, mountain ash, and bird cherry. Apples, pears, plums, and cherries, scarcely grow at all, although carefully cultivated; but considerable varieties of berries are spontaneously produced, amongst which are black currants, and raspberries of an exquisite fragrance. It may be stated, that in Swedish Lapland the vegetable productions bear a nearer resemblance to those of Siberia than the plants of the western part of Lapland, which, towards the sea, are analogous to those of Scotland and Iceland. The most abundant indigenous vegetables are the sorrel, which is prized on account of its antiscorbutic properties; the angelica, a highly-relished article of food; and the *lichen rangiferinus*, the staple of the rein-deer during winter. Towards the south are gardens in which the vegetables of the temperate zone are cultivated; and various flowers, including roses, carnations, and the like, also adorn these enclosures. Potatoes reach the size of poppy-heads (those of Finmark are very sweet, and of a waxy consistency); French beans, broad beans, and tobacco, where care is taken with it, are raised, but neither peas nor white cabbage come to perfection.

With respect to the climate and vegetable productions of Alten, Sir Arthur de Capel Brooke observes, "in speaking of its horticulture, it might be supposed that the produce of a country under the latitude of 70° would be extremely scanty. This, however, is not the case. Most kinds of vegetables succeed perfectly well, and are cultivated in sufficient abundance for the wants of the inhabitants." This traveller then proceeds to mention the cultivation of the potato, which is raised to some extent in Finmark.

Animals.

Most of the wild animals common to Norway and Sweden are found in Lapland. Bears are numerous; and though the rein-deer evades destruction by the rapidity of its flight, yet cows, goats, and sheep frequently fall victims to their rapacity. These animals are extremely partial to a certain kind of berry which is abundant in the country; but they likewise feed on grass. Wolves and foxes are plentiful, and the former are likewise very destructive to the tame animals; the skins of the latter are much prized in the north of Europe. The glutton, which is strongly furnished with teeth, as well as very sharp nails, is common; and its skin, on account of a white shining streak with which the neck is marked, is held in great estimation. In the woods the glutton frequently surprises the rein-deer, by suddenly descending upon it from the branch of a tree, and killing it by mangling the neck with its teeth. Otters of different kinds, ermines, a species of white weasel, squirrels whose skins are beautiful and much valued, the *mus lemmis*, a species of marmot peculiar to the country, and field-mice in vast numbers, are all natives of these high latitudes. The beaver is found in some parts, but seldom on the rivers. The wool and the skin of this animal are marketable commodities. Hares are bred in great numbers; and they are distinguished by the striking peculiarity of changing their colour from gray to white during winter. Coverlets are made from their skins. There are three species of martens found; the *steen-maar*, which inhabits the rocks; the *birfe-maar*, which makes the birch-tree thicket its home; and the *furr-maar*, which haunts the fir-trees. There are said to be a few elks, but of wild rein-deer the number is very great. From these to the individuals of the race which have been domesticated, the transition is natural. The most valuable part of a Laplander's possessions, and the chief object of his care, is the rein-deer. It unites in itself the best qualities of almost every other animal which has been found essential to the comfort of man in other countries to which it is a stranger, being at once the horse, the cow, the sheep, and the stag of Lapland. Its milk is so rich as to require being diluted before it is used. Its flesh is superior to that of the sheep; and, from its tractability and natural power of endurance, it drags the sledge of the Laplander with extraordinary speed and perfect safety over the desolate and chilling regions of snow which he inhabits. It is, moreover, easily maintained, finding its food, the favourite moss which goes by its name, amongst the frozen wastes during winter with perfect ease. These animals are also said to feed on frogs, snakes, and mountain-rats, and to be very partial to human urine, which they lick up with avidity whenever it comes within their reach. But the possession of this invaluable quadruped is very uncertain, for the wandering herds sometimes disperse themselves in the woods, from which it is difficult for the shepherd to dislodge them. They are, besides, not easily milked, and yield but a small quantity at a time, so that a large flock is necessary before the head of a family can be supplied with a sufficiency of food and milk. In shape they resemble stags; and their hair, at first gray, becomes blanched before it falls off. They cast their horns annually; those of the male are often two feet and a half in length, and their points are frequently as far asunder. They are generally four feet in height from the foot to the top of the back; and the length from the shoulder to the tail is two feet. A crackling noise is heard when they walk, which is asserted by some writers to result from the hoofs striking together when the foot is raised, but there are other opinions upon this subject.

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[1] Much confusion exists regarding the names of places and things in Lapland, and every writer must experience difficulty and be exposed to error in describing any portion or feature of that country or its inhabitants. Mountains, lakes, and rivers have frequently, indeed in almost every instance, more than a single appellation assigned to them; so that what is called by one name in any given work, will be found described under another designation in every other. This is particularly the case with regard to rivers, which, from their source to the sea, sometimes change their names two or three times.

The rein-deer is subject to various diseases from which other animals appear to be exempt, and during summer they are attacked by the *œstrus tarandi*, a large kind of bee, whose eggs, deposited in the skin, produce ulcerations not unfrequently destructive to the fawns. This great enemy of the rein-deer will pursue it for many miles; and in hot weather the Laplander takes a journey of some hundred miles to the sea-coast, principally for the purpose of avoiding its attacks. The *œstrus nasalis*, another tormentor of the rein-deer, makes small punctures within the nostrils, and there deposits its eggs. It is a singular fact, observed by Sir Arthur de Capel Brooke, that the rein-deer increases in size the farther north it is found. Cows, sheep, goats, and horses, have been naturalized in Lapland; but the management of these animals, together with other particulars regarding the rein-deer, we will afterwards have occasion to recur to.

Birds.

Of birds there are many found in Lapland which are unknown in other countries, such as the Lapland woodcock, the Swedish mock-bird or nightingale, called, from its melodious notes, "the bird of an hundred tunes," together with a peculiar species of the owl, magpie, woodpecker, woodcock, and others of the feathered races. Flocks of birds of passage resort to Lapland during summer for the purpose of breeding, amongst which may be enumerated the eagle and falcon tribe, owls larger than common, and occasionally white, crows or rooks in great numbers, ravens, partridges, large bustards, magpies, pigeons, plovers, ptarmigans, swans, wild geese, eider ducks, cocks of the wood, varieties of grouse, curlews, and various other feathered frequenters of the field or lake. Only a very few species of birds remain during winter, there being little subsistence for them in such chilly wastes of snow and ice. Common frogs and lizards are the only amphibious animals found. No venomous animal is to be met with in Lapland, but insects are in hot weather as numerous and annoying as in tropical climes. Besides the two already mentioned, the interior forests of Lapland swarm with gnats, which attack both man and beast with the greatest fury. The rivers abound in excellent salmon, and the lakes in perch, pike, trout, char, and other fish. The seas are also well replenished with the finny tribes, such as cod, tusk, and ling; and whales, particularly that species called the fin whale, so difficult to be captured, abound upon the Lapland coast. These enormous animals are very plentiful about Cape North; and Sir Arthur Capel Brooke was informed by the Laplanders that they are extremely partial to cows and horses, and will pursue a boat in which these are until they are landed.

Climate.

The climate of Lapland is of course very cold, but it is milder than that of any other region on the same parallel, the coasts of Siberia, for instance. The temperature of the air is regulated by the height above the level of the sea, and the distance from the Gulf of Bothnia, and may be divided into two regions, the inland and the maritime. It may be laid down as a principle which generally holds true, that in the former the winter is severe and the summer hot, whilst in the latter the winter is comparatively mild and the summer cold. An open and ever agitated sea is one great cause of the mildness of temperature which is experienced on the northern coasts of Finmark; but the maritime climate is much colder on the other side of Cape North, and the harbours on the coast of Eastern Lapland are sometimes blocked up in the middle of June. In the inland parts the summer is short; but in the sixty-six days during which there is no night, the crops are sown, ripened, and reaped. At this time the enlivening songs of birds are heard, and the earth is in some places covered with flowers. There is no darkness, and the coolness of evening is never felt. The heat is thus very oppressive, particularly in confined places, such as valleys. At this time insects are exceedingly troublesome. Acerbi, a traveller in Sweden and Lapland, found the degree of heat fifty-two of Fahrenheit in the shade, and eighty-one in the sun. The ground was so hot as to give uneasiness to the feet, whilst it oppressed the lungs; and the shrubs which were met with at distant intervals afforded little or no shelter to the traveller. In various parts of Lapland the days during summer are in brightness, geniality, and sereneness, equal to those of more propitious latitudes, and both delightful and healthy. Von Buch found the mean temperature of the month of July nearly sixty-three degrees at Altengaard, in north latitude sixty-nine degrees. In winter the cold is so excessive, that mercury, and even brandy, frequently freeze in the open air. All the lakes and rivers are covered with ice of great thickness, and the whole face of nature is buried beneath a sheet of snow several feet in depth. During the winter solstice the sun continues seven consecutive weeks below the horizon, when only a partial twilight prevails; but this "darkness visible" is to a considerable extent compensated by the superior brightness of the moon and stars, and the vivid beams of the aurora borealis, the light of all these luminaries being augmented by the whiteness of the snow, which keeps up a perpetual reflection from the earth's surface. Thunder storms sometimes occur during the depth of winter. When a thaw comes on, the atmosphere is filled with vapours; but during the prevalence of the north wind the air is clear and the sky is serene.

Vegetation depending more upon the heat of summer than the cold of winter, Enontekis is superior to the North Cape in bringing the productions of the ground to maturity, notwithstanding that the mean temperature is lower, because the heat during the summer is higher at the former than at the latter place. The covering of snow here also, as elsewhere, serves to retain the heat which the earth has imbibed during the warmer months, and preserves it in a better state for vegetation. At Enontekis the snow continues on the ground from October till May, whilst at the North Cape, being open to the sea-breezes, it is exposed to frequent thaws; nor is it likely, under such circumstances, it can ever lie so deep. On some of the inland elevations, particularly in Finmark, if the summer be very cold, it lies during the whole year, and entirely prevents vegetation from making its appearance, with the exception of some of the *cryptogamia*.

Agricl-
ure.

The soil of Lapland is generally sterile. The greater part of the country is covered with rocks or moss, or gravelly plains, or a kind of turf composed of mosses decayed by the frost, and impregnated with standing water. There are a few tracts of tolerable soil, especially in the more southern districts. The agriculture of Lapland is hence very trifling, for the soil yields but a very inadequate return for the labour which the hardy native bestows upon it; and in general he finds a more ready means of supplying himself with what he requires, by barter with the Russians. The following quotation, however, from Sir Arthur de Capel Brooke, presents a more favourable view of the climate and its productions than might have been anticipated. After mentioning the culture of the potato, already alluded to, and which is likely to be very beneficial to the country, as rendering it less dependent upon Russia for a supply of bread corn, he proceeds: "To this it may be added, that barley and rye are cultivated to some extent in parts of Finmark, particularly at Alten, although no agriculture is carried farther north; and this circumstance alone would induce us to form no unfavourable opinion of the climate of a place situated near four degrees beyond the polar circle. The Scotch fir, too, reaches Talvig in seventy degrees; and the *moltebær* (*rubus chamæmorus*) flourishes to the very verge of the North Cape, in 71. 10. 15. where the winter night is ten weeks in length."

rig of
aces.

Much obscurity veils the origin and early history of the inhabitants of Lapland. The Samoyedes, Esquimaux, Greenlanders, and Laplanders, appear to have been originally the same people. The more immediate ancestors of the latter were probably the ancient Finns, for the description which Ptolemy and Tacitus give of the Finni exactly corresponds to that of the highland Laplanders of the present day. We have already stated that the term Lap is only applied to them by Swedes and strangers. In their own language, the country, and Finmark itself, is called *Same Edman*, whilst the people are designated by the word *Samlash*. Thus a Norwegian Laplander, who is called by the Swedes and Norwegians Norsh Lap, would be in their tongue *Dadz Samlash*; a Swedish Laplander (Swensk Lap), *Lade Samlash*; and a Russian Laplander (Russisk Lap), *Ruosh Samlash*. Much confusion takes place regarding this nomadic race, for one day they may receive the name of Laplanders, and the next that of Finns, as they chance to wander either into the territories of Norway, or into those of Sweden. And there is another cause of error, arising from there being a race of people inhabiting Finmark, quite distinct from the Laplanders. These people are called Quäns; they are Finlanders who have naturalized themselves in some parts of Lapland, but at what time they settled in the country has by no means been well ascertained. It is, however, perfectly certain that all over Finland, Nordland, and parts of Swedish and Russian Lapland, they are and have ever been distinguished by the name of Quäns. The native of Finmark is considered as the most genuine specimen of the singular race which is generally designated by the term Laplanders. The circumstances in which he is placed have secured to him for centuries past, and will for centuries to come, a sort of rude independence. Born amongst barren mountains, to which agriculture can never be extended, there is nothing to tempt power to usurp his dominions, or circumscribe his liberty, with the feeling of which he is strongly impressed, as well as with a distaste for the restraints of civilized life. The Finmark Laps have been divided into two classes, the fishing or shore Laplanders, and the rein-deer or highland Laplanders. From their different habits of life, there is a marked distinction between the two; and there is yet another class of poorer Laplanders, who are numerous in all parts of Swedish and Russian Lapland. These are called *Skogslapper*, or wood Laps, dwelling almost entirely in the wooded parts of the country, their herds of deer being too small to enable them to live in the mountains, and trust to them alone for subsistence. They live in tents during summer; but when winter sets in they construct a more durable habitation, composed of sods, somewhat resembling the *gammies* or huts of the coast Laps. In the latter season they are stationary, and subsist partly on their rein-deer, but more on game and wild animals, which are abundant, and the constant pursuit of which renders them very expert at the rifle.

This kind of Laplander is unknown in Finmark, the country being mountainous, and nearly destitute of forests. The mountain Laps of the latter country are for the most part wild and savage, both in appearance and habits. They exhibit a degree of haughtiness and proud independence of spirit, which is wanting in individuals of the race who inhabit the plains of Russian Lapland or the shores of the northern coast. Until softened by a present, they are surly and morose in disposition; and their suspiciousness of temper detracts much from any hospitality which is apparent in them. The stranger must therefore remove this natural mistrust of the Lap before he can expect to receive from him any attention; and brandy, above all things, is the most potent softener of his feelings. This, or a present of tobacco, is so efficacious as to render him quite a different person, and willing to perform any service to the donor.

Dress,
manners,
character,
&c. of the
people.

The dress of the mountain Laplander of Finmark does not materially differ from that of the inhabitants of other parts of Lapland. In winter they are entirely clothed in rein-deer skins, consisting of a *pæsk*, or frock of rein-deer fur, or, what is more common, a *muadda* or sheep-skin garment. This is belted up by the leathern girdle (*buagan*), to which is suspended the knife, the tobacco pouch, and shooting apparatus when they follow the chase. The first is a long knife, not unlike that of a butcher, the handle of birch root, and the blade of great substance and strength.

The driving pæsk is composed of the thickest and best skins his deer afford; and, as a further protection whilst travelling, a broad bear-skin tippet covers the shoulders, and reaches nearly as low as the elbows. The lower part of the dress consists of the *bællinger*, a sort of loose spatterdashes or leggins, which, being drawn over a pair of long, loose deer-skin pantaloons, reach from the ancles high up the thigh. These are whole, and fastened or tightened at the top by a running string, and covered over at the bottom by the *skallkomager*, or high rein-deer shoes, and the *komager baand*, which is a long, narrow band, going several times round the ancle, keeping the whole tight together, and preventing the possibility of any snow from getting in; for the upper parts of the *bællinger* are of course covered by the pæsk, which, when girded up, reaches just below the knees, but, when loose, falls down nearly to the ground. In summer, the heat of the weather compels them to make an alteration in their dress, and the rein-deer pæsk is exchanged for a round frock of wadmal cloth. This *gappe* or summer frock, which is generally made of the skins of young deer, extends below the knees. On the head is worn a small low cloth cap (*gappir*), turned up all round, with a facing of fine rein-deer fur. No shirt is worn next the skin, linen being a luxury with which the Laplanders are entirely unacquainted. The use of stockings is likewise unknown, but a substitute is found in the soft dried grass called *sena*, with which the shoes are well stuffed. The hands are protected by rein-deer gloves, or rather mittens, being without fingers, but stuffed with the same kind of grass as the shoes. Almost every part of the winter dress of the Laplander is thus furnished by the useful animal which is the companion of his wanderings. The pæsk is made from the whole hide of the deer killed during winter; the bællinger and gloves, of the skin covering the legs and thighs of the animal; and the shoes are taken from the skin between the horns, and covering the crown of the head. The fur is worn on the outside, and, from the peculiar closeness and thickness of its texture, it is impossible for the cold to penetrate it. Every part of a Laplander's dress is worn loose, and thus the blood is allowed to circulate freely, an advantage which could not be enjoyed were the clothes tight on the skin. The dress of the coast Laplander is entirely similar to that of the mountaineer, except that when the weather is not warm, he usually wears a sheep-skin garment called *muadda;* and the wool being next the skin, it is rendered nearly as warm as the rein-pæsk, though this also he commonly wears in winter. The former, however, being the produce of his own flock, and made up by himself, is naturally in more general use. The rein-deer skins are obtained by barter from the highland Laplanders, and being made into garments by the inhabitants of the coast, who are expert at this kind of work, are again sold or exchanged for silver money, or the necessaries they may require. The women have some skill in embroidery, and collars and cuffs of the wadmal dresses, both male and female, exhibit their taste in the art of adorning. The dress of the females very much resembles that of the men. In winter a frock or pæsk of sheep-skin, worn with the woolly part inside, is bound to the waist by a belt, to which a small knife is suspended. In summer the sheep-skin frock is exchanged for one of wadmal cloth. The cap is sometimes made of various kinds of cloth, and it is usually encircled by a ribbon. The fondness of these people for anything gaudy is very conspicuous in their summer dress, for the necessities of winter compel them to keep it more unvaried. During the hot months the Lapland costume is very picturesque, from the variety of colours combined in it. It is then, particularly on the sabbath-day and on holidays, that he shows his pride, by making his appearance in all the finery that his means will afford. The usual colour of his *koften* or daily frock is white, with several edgings of blue and red cloth round the bottom and cuffs, but his Sunday garment is of a more ornamental nature, and frequently of thin cloth, richly embroidered in party colours round the cuffs and collars. In some parts of Lapland koftens of black cloth are met with, and those that are wealthy sometimes array themselves in scarlet ones. On extraordinary occasions, other parts of their dress are also of a finer nature than what is commonly worn. As may be supposed, even the best species of cloth which finds its way to these regions, is of a very inferior quality; it is chiefly of German manufacture, although cotton from England is also found here. Those of the women who can afford it, adorn their persons with rings, and ribbons of the gayest colours flutter around their bonnets. Like the Greenlanders, and other inhabitants of high latitudes, females wear pantaloons like the men, a practice which was in all probability had recourse to for personal comfort, in regions where open garments would have unnecessarily exposed the body to the cold. It may be mentioned, that the dresses of the families of the merchants who live on the coast are very superior, in point of elegance, to the garments of the native Laplanders.

The difference of character between the highland and coast Laplander has already been adverted to. The former is known by his haughty expression of countenance, and proud independence of demeanour. The more domestic habits of life of the coast Laplander, render him a more quiet and inoffensive being, and give to his features a milder and a somewhat vacant expression. Speaking of the Laplanders in general, they must be considered as a diminutive race, though not such pigmies as is commonly supposed. The Norwegian Laplander is superior in stature to the rest of the race, and this difference is probably to be attributed to the freer and purer air of his mountains rendering him more hardy and robust. The average height of the highland Laplander may be considered as varying from five feet to five feet two inches. They sometimes, but very rarely, exceed this stature. The characteristic features of the race are small elongated eyes, high cheek-bones, wide mouth, and a pointed chin, with little or no beard. Their hair is generally brown, or dark coloured. Their bodies, from their habits, are naturally spare, and devoid of corpulence, though in general they are ill made. They are bony and muscular, possessing greater strength than their stature would seem to indicate, active, and capable of enduring almost any fatigue. Their hands and feet are remarkably small; their voice is weak, and its tones have a squeaking effect upon the ear of a foreigner. In their moral character the Laplanders exhibit some marked peculiarities. Their passions partake of the torpor of the climate, and flow in a slow, cool, and regular course, unbroken by those sudden ebullitions and transports which characterize the men of warmer latitudes. Love, or the amatory feeling, is but a lingering spark, only sufficient to answer the purposes of nature. They possess in a remarkable degree the virtue of continency, and the conjugal relation is rarely or never violated, although both their parental and filial affections are weak. Anger and bloodthirstiness are unknown to them; and Sir A. Capel Brooke found, in 1823, that, during the space of twenty years, only one murder had been committed in Finmark. Although they are generally cautious, mistrustful, and suspicious, especially of strangers, as well as cunning in their commercial dealings, yet theft is almost unknown amongst them. The absence of this vice is proved by the fact, that locks, bolts, and other safe-guards, are considered as unnecessary appendages to a door. They have been accused of avarice, but without any just reason; for whatever strictness they may observe in bargain-making does not arise from a wish to hoard up money, but that they may be more bountifully supplied with their favourite beverage, brandy, of which they are excessively fond. Drunkenness is not only common, but may be said to constitute a feature of their character. In temper the coast Laplander is of a kinder nature than the mountaineer, and he is more inclined to hospitality, although this virtue is by no means very conspicuous in either. They are generally passive, without much courage, and altogether of a very peaceable and inoffensive disposition. They now exhibit little of a warlike spirit, although in former ages they were frequently the cause of terror to the Norwegians. Notwithstanding their ebriety, health is a blessing which the inhabitant of Lapland enjoys in a high degree. They were formerly addicted to degrading superstitions; and the witchcraft in particular which was exercised amongst them has passed into a proverb. Milton alludes to this circumstance when he speaks of dancing "with Lapland witches." They were famous for their empire over the winds, which they disposed of in bags to the credulous mariners. In performing their infernal rites, the instrument used was the magical drum, by beating which as an accompaniment to other ceremonies, they fancied they had the power of foretelling future events, curing diseases, and exorcising evil spirits. Their mythology was distinguished by an universal idolatry, in which the elements were typified, and a polytheism, by which every object in nature was changed into a god. But on these wild creations of the human mind in a state of ignorance and barbarism it is unnecessary to dwell. The rites by which the worship of their deities and idols were celebrated are now unknown, being supplanted by those which have their origin in the milder and purer genius of Christianity.

Habitations.

The habitations of the Laplanders now demand description. The mountaineers live in tents, which differ in no respect in summer and winter, and are of very simple construction. They are formed by six beams of wood rising in a pyramidal form, and meeting nearly at the top, covered with thick and coarse cloth, a flap of which, left loose between two of the beams, constitutes the door. The height of the tent is generally about six feet, and the whole circumference of the inside seldom exceeds fifteen or eighteen feet. The floor is strewed with rein-deer skins, having the hair upwards, and which thus serve for either lying or sitting on, the tent being too low to permit of the occupants assuming the erect posture, except in one place. A stone frame is made in the middle for the fire, and there is a hole at the top to which the smoke must find its way; but its speedy egress is by no means considered as necessary to comfort. The fumes thickly impregnate the whole tent, as well as "all which it inhabit;" a species of japanning highly valued, as affording a protection in winter against the cold, and in summer against the swarms of musquitoes. Cabined and confined in this limited domicil, it is here that the Laplanders, seated on their heels in the manner of the eastern nations, or squat like toads, spend in all the beatitude of idleness the moments which they can spare from their pastoral avocations. The different provisions are kept in boxes attached to the stakes; and boxes are ranged on the inside round the cloth or covering; but these precautions are often unavailing against the impetuosity of the blast, whilst the thinness of the tent naturally exposes the inmates to the severity of the weather. In regard to habitation, the shore Laplanders have a decided superiority over those of the mountains. The gammie or hut of the former is usually about five feet in height. It is generally of a circular or oblong form, having the appearance of a large rounded hillock, which name it may be said to deserve, being composed of turf laid on branches of the birch, and supported underneath by a wooden frame-work of stronger materials, to bear the weight of the whole. The entrance is by a low, narrow passage, at the extremity of which is the door communicating with the part inhabited. Around them are generally enclosures for the cattle, and several racks of coarse fodder for their winter food. The farming stock of the coast Laplander consists of a few sheep, and sometimes a cow or two, which are kept in the enclosure during the summer season, and in winter occupy the same buildings with their owner, being supported during the latter partly by the coarse fodder which he has been able to collect, but chiefly by the remnant of his fishing produce.

Habits and modes of life.

Necessity has rendered the highland Laplander a wanderer, and habit has made that mode of life a second nature to him. It is upon the rein-deer that he almost entirely, if not altogether, depends for subsistence; and hence their welfare is the chief object of his care, in promoting which he is compelled annually to take long journeys to the sea-shore for the purpose of avoiding the attacks of insects. His habits of life are thus in a great measure formed; and the year is divided between his abode on the mountains and his migrations to the coast, whilst his life as a whole consists of the extremes of bodily fatigue and total inaction, plenty and want. When he is hungry, and has the power of gratifying his appetite without restraint, he is perfectly ravenous, and devours a quantity sufficient to support him for several days. Those who inhabit high latitudes, where subsistence is precarious at certain seasons, seem all to have a remarkable capacity of stomach, and to be capable of eating an enormous quantity at a meal, so as to serve them for five or six days, without being annoyed by the load. The necessities of their situation have compelled them to practise this frequently, and custom has rendered it easy. The Laplander's household economy, it may readily be imagined, is simple in the extreme. His food during the period of his summer rambles is spare and frugal, and without any indulgence in rein-deer venison, his favourite food and the luxury of the winter season. In summer he is intent only on increasing the number of his flock, and on providing against his future wants. He contents himself then generally with milk, and the remains of the curd and whey after making his cheese. The first is taken sparingly, on account of the small quantity which a single deer yields, as well as of the great importance it is to him to secure a good quantity of cheese for his winter stock, and to guard against any disaster that might befal his herd and reduce him to want. As he milks his herd during the summer season only, when this approaches a close, some milk is generally preserved for the purpose of being frozen. This serves not only for his own individual use during the winter, but, being highly prized for its exquisite delicacy in this state, it constitutes an article of trade; and the merchants with whom the Laplander deals, and who then repair to the interior, gladly purchase it at any price. Though the rein-deer milk is thus of a very rich quality, yet the cheese made from it is extremely bad, and unpalateable to any one but a native. It is made by simply placing the milk in a large iron pot over the fire, which, with the addition of rennet made from the stomach of the deer, quickly coagulates. The curd is then pressed, and the whey, being separated from it, is put into shallow moulds of about the size of a small plate. Bad as it is, the hardy Laplander is very partial to it both raw and roasted; in the latter state it appears at the tables of the merchants, and is rather more eatable than when unprepared. When heated, an oily juice exudes from it, which is found of great use in removing the effects arising from being frost-bitten. Butter is seldom if ever made of rein-deer milk by the Laplanders, but it is so by the Finland settlers, who in many parts of Lapland keep herds of rein-deer, the colour of which, it is said, is peculiarly white. The Laplanders sometimes vary their dishes by mixing different kinds of wild berries with the whey, the latter being previously boiled till it acquires some degree of consistency. They are no less fond of the roots of the angelica, which has an agreeable taste, and likewise possesses antiscorbutic properties. Much value is set upon the blood of the rein-deer, from which a variety of dishes is prepared, care being always taken to preserve it when the animal is killed. It is also supposed to possess antiscorbutic properties. Those who reside upon the coast subsist chiefly on fish, with a little beef and mutton occasionally. The furniture consists of horn spoons, pots and kettles made of brass or copper, and sometimes of stone, wooden bowls capable of holding about twelve quarts, a basket for holding cheese, and a barrel for oil and other liquids. Some of the richer natives possess the more showy utensils, such as pewter plates, and spoons of silver. The highland Laplanders obtain all the artificial light which they require from the fire alone, but those on the coast use a rude sort of lamp. One or two shelves for cheese run along the upper part of the house; and a few rennet bags, containing the milk for winter use, are suspended from the roof. Oval fir boxes, answering for panniers, are employed in transporting their goods; two of them, weighing about two pounds each, are carried by one rein-deer. The most ornamental article of furniture is the cradle, which is a piece of wood hollowed out, and having a recess for receiving the head of the child, and being provided with cords, by which it is fastened to the mother's back when she travels. In shape it somewhat resembles the sledge, with the lower part open, and the upper protected by an arched covering made of leather, which shelters the head of the infant. It is stuffed with soft moss, is portable and safe, and, when slung on the back, the head of the child appears above the shoulders of the mother, whose hands are left at liberty, and who is otherwise little incommoded by her burden in travelling.

Herds.

The herds of the Laplanders vary much in size, and this circumstance constitutes their riches or poverty. He who has 1000 rein-deer is accounted rich, though instances are by no means rare of one individual possessing 1500 or 2000 animals of this description. With three hundred a family may live in tolerable comfort, but with one hundred subsistence is precarious, and fifty reduces a Laplander to the state of a menial. He is no longer independent and able to keep a separate establishment, but generally joins his herd to that of a richer proprietor, whom he serves in the capacity of a servant, milking and tending the herd. Sometimes when thus reduced he migrates to the sea-coast, where he supports himself by fishing or otherwise. If successful in his efforts, he returns, purchases a herd, and resumes his pastoral habits. It more generally happens, however, that having once become a coast Laplander, he remains so to the last, being naturally too thoughtless and improvident to carry his views beyond the exigencies of the moment. Should the herd of the mountain Laplander be at all numerous, it rarely happens that the possessor is aware of the exact number, there being a superstition prevalent amongst them, that counting the flock, like numbering the heads of the Israelites, will be attended with evil. During the day they are allowed to wander over the hills where they please, but watched by a shepherd, who observes their motions, and is assisted in his duties by several dogs. These are in readiness not only to guard against any attack of wolves, but also to prevent the herd from being too widely dispersed, and to assist in bringing them to the fold in the evening to be milked. After they are brought into this enclosure, and secured by a cord attached to the horns, and held either in the hands, or fastened to some shrub, the women bring their bowls from the tent, and proceed in the operation in the usual way. Many of the deer are very refractory whilst this is going on, and, butting with their horns, not unfrequently overthrow the female in attendance. The Laplander justly sets a very high value upon his dogs, the services of which are invaluable. The breed is remarkable for the smallness of its size, resembling the arctic fox in every thing but colour.

Employments.

The employment of the highland Laplander may be said to be entirely confined to the care of his deer; and when not actively engaged in tending them, he most frequently stretches himself in his tent in a state of listless ease, or amuses himself by fashioning a rein-deer's horn into a spoon. But this monotony is occasionally broken by a hunting excursion, in which he pursues the bear and other animals. Ptarmigans, foxes, gluttons, martens, and other animals, he either shoots, or catches by means of traps and snares. He has several kinds of sledges, both for the conveyance of himself and of his effects. The pulk, which is intended for the use of merchants and other travellers, in form resembles a boat, and is about seven feet in length by sixteen inches in breadth, and generally about eight inches in depth, the back board or stern part being about sixteen. The head of the pulk comes to a point like a canoe; the stern is flat, and the bottom or keel convex. Above it has an oval half deck in front, covered with seal-skins. This is the close pulk; the open sledge wants the deck, but its general dimensions are similar to the other, and it is made, like it, of birch wood, although of ruder construction, and finished with less care. For the conveyance of goods, there is another open sledge of much larger dimensions, being about eight or nine feet in length, and of proportionate breadth. One deer is sufficient for a sledge, to which it is attached by a very simple harness, consisting of a collar of rein-deer fur for the neck, a trace which passes between the legs of the deer, and through a broad belly-band of cloth fastened round the body of the deer. There is of course a bridle and rein, and round the neck is a loose band of cloth, to which a bell is suspended, the sound serving to keep the party together. Although the difficulty of preserving the equilibrium of the pulk is at first very great, yet, so expert is the Laplander in guiding it, that the chief accidents that happen to him in his winter expeditions arise either from losing his way, or being caught by snow-storms or snow-drifts. Without these convenient vehicles it would be impossible to traverse a country so rugged and broken as Lapland, and even with this advantage as to locomotion, the difficulty is very great. The speed with which the animal travels is remarkable, ten miles an hour being easily accomplished at a trot, and probably double that space at a gallop. In the interior parts of Lapland travelling is suspended during summer, roads being unknown here; and it is only in winter that, by the aid of this invaluable animal, the country can be traversed. In some parts of Lapland, rein-deer have been made available for agricultural purposes, such as ploughing and harrowing; but this only happens when the proprietor is very poor. They are likewise employed during the winter season in drawing hay and fodder loaded upon trays. The Laplanders, especially those of Finmark, have a mode of travelling by means of the *skie* or snow-skait. It is made of wood, is very narrow, but frequently more than seven feet in length. In many parts of Lapland the greatest use made of them is in pursuit of wild rein-deer, and the other animals with which the country abounds. With these he makes rapid progress, and undertakes very long journeys without any other means of locomotion.

Migrations.

Various reasons induce the mountaineer to repair to the coast during the summer season. First, that his herd of deer may escape the gad-fly, with which, in June, July, and August, the rein-deer are much tormented; and secondly, to sell or barter the disposable commodities which he has collected during winter. These consist of the skins and horns of the deer which he has killed for the support of his family during winter; and the skins of other animals which he has succeeded in capturing, such as the bear, fox, glutton, and marten, and the feathers of the ptarmigans which he has shot or ensnared. All these are valuable articles of commerce to him; and, by bartering them with the merchants of the coast, he is enabled to procure others that are necessary to his comfort in winter, such as coarse cloth, meal, gunpowder, and tobacco. It is also a matter of belief with the Laplander that it is absolutely necessary to the existence of his rein-deer, that they should once during the summer drink salt water; and this forms another and a very strong inducement for him to visit the coast. The deer eagerly drink salt water, and the draught is said to be efficacious in destroying the larvæ of the gad-fly, which lays its eggs in the hide of the animal previously to quitting the forest. The annual migration of the Laplander commences in June, by which time the snow is generally off the ground, and consequently his mode of travelling is no longer in sledges. These, with all his winter necessaries, are left behind him in his summer expedition, and he commonly deposits them in the storehouse which almost every highland Laplander possesses, near his church, in the neighbourhood of which he generally remains during the winter. The distance which he has to travel varies according to the situation of the coast to which he is bound, but sometimes exceeds three hundred miles. Sir Arthur de Capel Brooke, speaking of migrations, observes, "the Swedish Laplanders that repair to the coasts of Tromsöe and Senjen belong chiefly to Tornea Lapmark, inhabiting the shores of the Tornea Träsk. These parts are also the resort of those from Enontekis, in Russian Lapland. The Laplanders from the other Lapmarks make for other parts of the Norwegian coasts which are nearest to them; and, though the distance may be less, they do not, I believe, ever bend their steps toward the Gulf of Bothnia, preferring the coasts of Norway, from the absence of wood, the freshness of the breezes, and the freedom from the insects which swarm in the forests that skirt the shores of the gulf, as well as in their own."

In studying the health and safety of their herd, they generally make choice of the numerous islands on the western coasts of Norway and Lapland, from their superior coolness, as well as from the absence of bears and wolves. These also present a great advantage in being very convenient stations for fishing, and possessing good harbours; whilst fish likewise resort in great numbers to the numerous fiords or bays, and narrow channels between them. This is the reason why on the whole of the northern line of coast the mainland is nearly uninhabited, with the exception of the borders of the fiords, though the only supply of wood is to be found there; whilst almost all the rocky isles so profusely scattered along the coast possess inhabitants, although generally barren in the extreme. After the mountain Laplander has reached his fishing station, he erects his tent of coarse wadmal cloth, and proceeds to barter his skins, furs, and other articles of commerce, for necessaries which he requires, but principally for brandy, which he drinks to excess. Indeed it sometimes happens, that when he is about to return to his winter quarters, he is occasionally obliged, though reluctantly, to part with his deer, in order to supply himself with what is absolutely necessary to his existence. The mountain Laplander makes it a point to be paid in silver in all his dealings with the merchants; and he frequently amasses a considerable quantity of dollars, which he usually buries in the ground in some spot near his tent. In September, he breaks up his summer quarters, and gradually retires into the interior parts of the country. The circumstances which oblige him to return is the want of rein-deer moss on the islands, and also of fuel, both of which are readily procured in the interior parts of the country. The want of the latter is said to have led to the gradual and almost entire depopulation of the Finmark coasts. His stock of necessaries and household utensils are packed in a kind of wicker pannier, one of which hangs on each side of the deer, and, by slow and easy stages of six or seven miles a day, he reaches that part of the continent where he intends to fix his winter abode. Venison constitutes the principal article of food of the highland Laplander in winter, the only season when he kills his deer for supporting himself and his family.

Fishery, &c.

The coast Laplanders support themselves entirely by the fishery, which is astonishingly productive, 2000 lbs. weight of cod-fish being caught in a day by means of lines alone. From the great number of small Russian vessels which frequent the coast at certain seasons, they find a ready sale for the fruits of their industry, receiving in exchange chiefly meal, brandy, tobacco, and the like. Whales are abundant, particularly what is called the fin whale, which is long, active, swimming with great strength and speed, and consequently difficult to capture. It is usually killed by darting the harpoon into the body, and then breaking it close off. No more notice is taken of it at the time, but the wound generally proves mortal, and in a few days the animal is found cast upon some part of the neighbouring shore. The value of a good whale of this kind is about L.150, or 1000 specie dollars. The owner is known by a mark on the barb of his harpoon, by which he identifies his property; but law entitles the finder to one third of the booty. Great quantities of other kinds of fish, particularly the sey or coal-fish, are likewise caught. The latter are taken by means of nets, and this fishery constitutes one of the most lucrative branches of the Finmark trade, as does the down of the eider-duck. Plaice of a huge size, halibut, and echini of all hues and sizes, are likewise amongst the fish taken; but of shell-fish there are few or none, the northern shores, from their nature, being particularly barren of testacea. Halibut of 500 lbs. weight is frequently taken, and it is esteemed a great delicacy. The farming stock of the coast Laplander consists of a few sheep and goats, and sometimes a cow or two; but pigs are little known in Finmark, and do not constitute part of his property, sheep being of superior utility in furnishing him both with food and raiment; and his wants are, besides, very limited. On the approach of winter the whole of the cattle are brought from the mountains, where they are sent to graze during summer, and are shut up in stables. The weight of the cattle is not considerable. During winter, as a substitute for fodder, they are almost entirely fed upon fish, to which they are very partial. Some of the shore Laplanders keep rein-deer, but these animals very rarely constitute part of their property.

Arts, manufactures, amusements, &c.

In their manual arts and manufactures, that is, making the various utensils which their mode of life requires, the Laps display some ingenuity. Their sledges and canoes are very strongly and closely put together, so as to be entirely impervious to water. They tan hides with the first inner bark of the birch, make strong cordage and thread of the sinews of the rein-deer, weave coverings for their tents, knit gloves, fashion wooden utensils for domestic purposes; and the women prepare the skins of foxes, fawns, otters, and other animals for sale, by stripping off the membraneous parts, and curing them with fish-oil. The Laplanders have a few amusements, but the chief is hunting, which, however, rather constitutes a part of their professional avocations, than of their choice pastimes. The bow and arrow, which formerly constituted their offensive weapons, are now supplanted by fire-arms, particularly rifles, in the use of which they are very expert. A taste for music and poetry have been attributed to the Laplanders; but this, Sir Arthur de Capel Brooke observes, is a mistake, arising from travellers mistaking Finns for Laplanders, a circumstance which very frequently takes place. Amongst the amusements of the Laplanders may be mentioned their occasionally assembling at feasts, where the favourite beverage, brandy, freely circulates, and mirth and noisy loquacity prevail. At marriage-feasts hundreds meet, and the ceremony is conducted with great formality and decorum; but the more solemn ritual of a funeral is characterized by an appropriate want of any thing like parade or show.

General description.

In order to present a view of those parts of the Lapland continent, as well as of the numerous islands with which the shores are crowded, we shall follow the route of a recent traveller.[1] Loppen, the first island in Finland, coming from the south, is about ten miles in circumference, but very narrow. It contains five or six families, and has a church and a resident clergyman. Scattered patches of the soil are good, and might produce corn if cultivated; but this is no motive for doing so, as it is more cheaply and easily obtained from the Russians in exchange for fish. At a few miles' distance from Loppen is Soroe, the largest island in Finmark, and inferior in size to few in Norway. Its dimensions have not been definitely stated, but it is supposed considerably to exceed one hundred miles in circumference. It is thinly peopled by a few Norwegians and shore Laplanders; and the whole of the western coast is uninhabited, on account of its great exposure to the fury of the northern storms. It merely consists, like the rest of the island, of high precipitous rocks and mountains, enclosing deep valleys, which in summer are not without considerable luxuriance of vegetation, being penetrated by numerous fiords or arms of the sea, which run a considerable way inland. The principal place here is called Havsig; and it has a church, where the clergyman of Loppen ministers, the two parishes being under his care. They contain between them only about two hundred inhabitants. Seyland is a pretty large island, but very mountainous. Qualöen, or Whale Island, where Hammerfest, a town founded by government, is situated, presents a miserably naked and barren appearance, hardly a shrub being seen, and only rocks piled upon each other in wild magnificence. The town consists of a few scattered houses belonging to the merchants, which are built of wood, and painted all over with a kind of red ochre. Behind them is a church, and near it the residence of the clergyman. Close to these, and overlooking the sea, there is a small battery. The Hammerfesters are extremely lively, and fond of dancing, singing, and merriment. Balls are very frequent, at which the ladies appear in very gay, even elegant dresses, of English manufacture. Since 1808, when this place was visited by Von Buch, its trade and population has improved so considerably as to afford sanguine hopes of the future. In the year 1810, the population was only seventy-five, and in twelve years it had increased to considerably more than two hundred. Their commerce consists, first, with the foreigners, who supply the merchants with their own manufactures, and different kinds of colonial produce, and receive payment in the native staples, fish and oil; and, secondly, in the local or home trade between the dealer and the natives, who barter the fruits of their industry for meal, cloth, brandy, and other articles. The whole of the commerce of Hammerfest, however, is inconsiderable, compared with that carried on by the Russians, which constitutes the most important feature of the trade of Finmark; and, though still in its infancy, is of such importance as to deserve being mentioned. The Russians who visit Finmark come chiefly from Kola, the Gulf of Kandalax, and the borders of the White Sea. They belong to the poorest class, and conduct their trade solely in small three-masted vessels of from thirty to one hundred tons burden. Several hundreds of these make their appearance about July, and anchor in the vicinity of the fishing banks, to be in the way of the mountain Laplanders when they return to the coast, with whom a traffic is carried on chiefly on the principle of barter. The Russian delivers his cargo of meal, hemp, flax, copper, tar, sailcloth, lines, and other articles, and receives in exchange any foreign produce he may require, but, generally, the various kinds of fish which are bought by the vog, which is about forty pounds English. The importance of this trade, both to Russia and Finmark, may be estimated from a statement made regarding this particular branch of commerce, that no less than 100,000 vogs of fish were annually taken from Finmark by the Russians. A considerable trade is also carried on in fox-skins, which fetch from two to four specie dollars. The bay of Hammerfest is well sheltered, and the harbour, though small, is very secure, and frequently contains a number of vessels from different countries, England included.

Passing over a few desolate and unimportant islands, such as the Stappen Isles, well known to English mariners under the name of Mother and Daughters, we come to that of Mageroe or Lean Island, where North Cape is situated. This name is sometimes applied to the whole island, but properly only belongs to its northern extremity. This island is about seventy miles in circumference, and is very narrow, being intersected by long and extensive *fiords*, which cut deep into the land on both sides, and nearly meet. On the mountains about two hundred deer may exist, the property of Laplanders, whom the breadth and turbulent nature of Mageroe Sound confine permanently to the island. On some parts of it there is brushwood, but its characteristics are sterility and desolation. The North Cape is a long extended headland or tongue of rock, narrowest near its root, and enlarging itself towards its other extremity, where it takes a circular form, and is indented by several chasms that form small creeks. Its surface is flat, and destitute of vegetation, but thickly strewed with fragments of rock, particularly quartz. Foxes are here abundant, and at certain seasons of the year sea-fowl frequent the island in vast numbers.

On the continent, the place which first demands attention is Alten, or Altengaard, a name applied also to a district the most populous and fertile in Finmark. The forests are the most extensive in the country, though now considerably diminished. The principal inhabitants are the Quäns, who occupy an entire village in the immediate neighbourhood of Alten. The situation of the latter is very advantageous in respect to the interior trade of Finmark, as it forms the principal means of communication, not only with the inland parts, but also with Sweden; and all kinds of merchandise being brought by sea to Alten, are forwarded to the various other parts of Lapland by rein-deer. During winter it is the scene of considerable life and bustle, from the continual arrival of strangers; and in February a fair is held, attended both by the merchants and by the coast and mountain Laplanders. It is situated in north latitude 70°, and is considered the coldest place in Finmark, yet here vegetation is by no means so contemptible, as we have already shown. The salmon fishery was once very considerable, and constituted one of the chief articles of export, but it has now much declined. About one hundred and fifty miles south from Alten is Koutokeino, which is also the name of a district of considerable size, but mountainous and barren. At this place there is a resident clergyman, who has a parsonage-house, which, like the abodes of other Lapland ministers, is a mere log-hut, consisting of one story, and comprising a small room and a back kitchen. The whole place, indeed, consists merely of a few log-huts, situated on the banks of the river Alten. Kangis, in Swedish Lapland, is celebrated for its fair, which is the great point of union for the whole of the Northern Laps. It lasts five days, but its importance has greatly diminished, on account of the reduced value of the mines. On the Muonio or Muonioniska River, is a town of the same name, the houses of which are much superior to those farther north. Here the population consists principally of Finns, the number of which tribe increases as the traveller proceeds towards the Gulf of Bothnia.

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[1] "A Winter in Lapland and Sweden, with various Observations relating to Finmark and its Inhabitants, made during a Residence at Hammerfest, near the North Cape, by Sir Arthur de Capel Brooke, Bart."

Population. The whole population of Finland is supposed not to exceed 60,000. The degrading superstition in which they were formerly sunk has now in a great measure disappeared, along with those numerous deities which they worshipped: the wild creations of unenlightened nature have been superseded by Christianity, and a knowledge of the true God. Regular clergymen are established in the country by the different governments, and the Laps exhibit much reverence and devotional feeling during divine service, although its purport is only known to them through an interpreter. Finmark, in regard to ecclesiastical regulations, is under the jurisdiction of the Bishop of Nordland and Finmark, both of which form one diocese. As may be supposed, the revenues of the crown are not materially benefited by the contributions of the poor Laplander. Every one, however, whether his abode be on the shore or on the mountains, pays a yearly tribute of four-and-twenty shillings, which may be considered merely as an acknowledgment of their being subjects of the power by which it is collected. A Laplander that is taxable has likewise to make an annual offering of a rein-deer ham and tongue to the *sorenskiver* or judge; and to the priest half a rein-deer with the exception of the breast part, a pair of rein-deer gloves, nine pounds of tallow, and a rein-deer cheese, which donation is called a *ritterbil.* This applies only to the Laplanders who derive their subsistence from their herds of deer; the shore Laplander pays his dues in fish. To collect the taxes for the crown, the *fogeds* or sheriffs, and *lendsmen* or sheriffs' officers, appoint general meetings of the Laplanders, at stated times of the year, when they receive their payments.

Language. The language of the Laplanders is a Finnish dialect, with so great an infusion of foreign words, that the inhabitants of the two nations require an interpreter before they can understand each other's meaning. "The numerous cases," says Malte-Brun, "the varied terminations of nouns and compound verbs, the method of expressing pronouns by *affixa* joined to verbs, and, lastly, the negative conjugations, are characteristics equally applicable to the languages of Finland, Esthonia, and Lapland. The last is in some respects still poorer than the other two; thus there are five words for snow, seven or eight for a mountain; but honesty, virtue, and conscience, must be expressed by a periphrasis. The Lapponic has been mixed, perhaps, still more than the other Finnic tongues, with the German and Scandinavian, which were spoken by the conquerors, who were too often the tyrants, of the Finnic race." Some old Hungarian roots are also found in it, from which circumstance, as well as from others, it has been inferred that the Laplanders are the descendants of a Hunnic mixed with a Finnic people, or perhaps a distinct branch of the great Finno-Hunnic race. The principal roots and derivatives in the Lapponic tongue certainly bear less affinity with those of the languages of Upper Asia, than any other Finnic dialect. (R. R. R.)

LAPSE, in ecclesiastical law, a slip or omission of a patron to present a clerk to a benefice within six months after it becomes void, in which case the benefice is said to be in *lapse*, or *lapsed*, and the right of presentation devolves on the ordinary.

LAQUEARIUS, a kind of athlete amongst the ancients, who in one hand held a *laqueus*, or sort of snare, wherewith to embarrass and entangle his antagonist, and in the other a poniard to stab him.

LAR, the capital of the province of Laristan, in Persia, once a magnificent city, but now in ruins. It is situated at the foot of a range of hills in an extensive plain, which is covered with palm trees. The houses are commodious and neatly furnished, each having a *badgeer* and *surdab;* the former to cool the inner apartments, and the latter to retire to in the summer season, in order to avoid the intolerable heat of the climate. The residence of the khan, or governor, is in the middle of the city, and is surrounded by a strong wall flanked with towers. The celebrated castle of Lar, now in ruins, is situated on the summit of a hill, immediately behind the town, and is said by the Persians to have been impregnable. The city is decorated with many handsome buildings; and the bazaar, which is in good repair, is said to be the noblest structure of the kind in Persia. It is very ancient, and is built in the same manner as that of Shiraz, but on a much grander scale, the arches being lofty, the breadth and length greater, and the workmanship in every way superior. It still contains 12,000 inhabitants, and is celebrated for the manufacture of muskets and of cotton cloth. Long. 52. 45. E. Lat. 27. 30. N. (Kinneir's *Geographical Memoir of the Persian Empire.*)

LARACHE, or EL ARACHE, a seaport town of the kingdom of Morocco, in Northern Africa, is situated at the mouth of the Luccos, a river which anciently bore the name of Lixus. This town, which formerly belonged to the Spaniards, has some neat buildings; and, though not regularly fortified, possesses a fort and two batteries in good repair. It has been made the imperial arsenal, and is very strong towards the sea. The town contains about four hundred houses, which extend from the banks of the river up the steep declivity of a hill facing the north. It was built, as well as the principal fortifications, by Christians. The streets are paved; there are several mosques, and a decent bazaar, surrounded with very handsome stone piazzas; but there is a great deficiency of water. The depth and security of the river, which is about half a mile across at the ferry, render it the best port which the emperor possesses for his larger vessels; but ships exceeding two hundred tons burden cannot get in, on account of the bar, which is continually on the increase. The road is not secure in winter during the prevalence of southerly and westerly winds, but from April to September inclusive it affords a safe anchorage. The climate is mild, and the same as in Andalusia. Larache is situated in long. 6. 1. 30. W. and lat. 35. 13. 15. N.

LARARIUM was a chapel which the Romans frequently had in their houses for the household gods, called *lares.* Spartian informs us, that Alexander the son of Mammeus kept in his *lararium* the figure of our Saviour, together with his other idols.

LARBOARD, amongst seamen, the left-hand side of the ship when you stand with your face towards the head.

LARCENY, or THEFT, by contraction for latrociny, *latrocinium*, is distinguished by the law into two sorts; the one called *simple larceny*, or plain theft, unaccompanied with any other atrocious circumstance; and the other, *mixed* or *compound larceny*, which also includes in it the aggravation of a taking from one's house or person.

Simple larceny, when it is the stealing of goods above the value of twelvepence, is called *grand larceny*, but when of goods to that value, or under, is *petit larceny;* offences which are considerably distinguished in their punishment, but not otherwise. *Mixed* or *compound* larceny is such as has all the properties of the former, but is accompanied with either one or both of the aggravations of a taking from the *house* or the *person*.

LARDNER, Nathaniel, an eminent English dissenting divine, was born at Hawkhurst, in Kent, on the 6th of June 1684. After receiving a grammatical education, he was sent first to a dissenting academy in London, which was under the care of the Rev. Dr Joshua Oldfield; and thence, in his sixteenth year, he went to prosecute his studies at Utrecht, under Professors d'Uries, Grævius, and Burmann. Here he remained above three years, and then removed for a short time to Leyden. In 1703 he returned to England, and at his father's house employed himself in the most close and diligent preparation for the sacred profession. But, notwithstanding his qualifications, it was not till 1709 that he preached his first sermon, on the authenticity and truth of the Christian revelation.

A few years after this, Lardner was received into Lady Treby's family as domestic chaplain, and tutor to her son, and continued in this situation till her ladyship's death in 1721. This event threw him into some perplexity, having preached to several congregations, during his residence with Lady Treby, without obtaining the approbation or choice of any one. It has been said that it reflects no honour upon the dissenters, that a man of such merit should so long have been neglected. But the pulpit was not the place in which Mr Lardner was calculated either to convey improvement or to acquire reputation. Dr Kippis informs us, "that his mode of elocution was very unpleasant; that from his early and extreme deafness he could have no such command of his voice as to give it a due modulation; and that he greatly dropped his words." It cannot, then, be matter of surprise that he was not popular; nor can it be any reflection upon the congregations to which he occasionally preached, that they did not choose a man who, notwithstanding his great learning and eminent virtues, was so deficient as a public speaker, that it was impossible to hear him with any pleasure, and scarcely without pain.

Though Mr Lardner had no church at which he officiated as minister, he was engaged with some of his dissenting brethren in preaching a Tuesday evening lecture at the Old Jewry. Acquainted probably with the direction of his studies, they also appointed him to preach on the proof of the credibility of the gospel history. This he discussed in two sermons; and prosecuting the subject which he had taken up in these discourses, he, in February 1727, published, in two volumes octavo, the first part of the Credibility of the Gospel History, or the Facts occasionally mentioned in the New Testament, confirmed by Passages of Ancient Authors who were contemporary with our Saviour or his Apostles, or lived near their time. An appendix was subjoined, relating to the time of Herod's death.

Thus Mr Lardner commenced author, and began his literary career with singular reputation. "It is scarcely necessary to say," observes Dr Kippis, "how well this work was received by the learned world. Not only was it highly approved by the Protestant dissenters, with whom the author was more immediately connected, but by the clergy in general of the established church; and its reputation gradually extended into foreign countries. It is indeed an invaluable performance, and has rendered the most essential service to the cause of Christianity. Whoever peruses this work will find it replete with admirable instruction, sound learning, and just and candid criticism." These two, with the subsequent fifteen volumes octavo, and the four thin quartos entitled Jewish and Heathen Testimonies, occupied him, with the interruption arising from some smaller productions, during the space of forty-three years.

Dr Kippis gives us a particular account of the time when each volume was published, and of the subjects discussed in each. Speaking of the Supplement to the Credibility, he says, "I cannot avoid strongly recommending this work to the attention of all young divines. Indeed, I think that it ought to be read by every theological student before he quits the university or academy in which he is educated. There are three other works which will be found of eminent advantage to those who are intended for, or beginning to engage in, the Christian ministry. These are, Butler's Analogy, Bishop Law's Considerations on the Theory of Religion, and Dr Taylor's Key to the Apostolical Writings, prefixed to his Paraphrase on the Epistle to the Romans. Without agreeing with every circumstance advanced in these works, it may be said of them with the greatest truth, that they tend to open and enlarge the mind; that they give important views of the evidence, nature, and design of revelation; and that they display a vein of reasoning and inquiry which may be extended to other objects besides those immediately considered in the books themselves. It must not be forgotten, that the Supplement to the Credibility has a place in the excellent collection of treatises on divinity which have been published by Dr Watson, bishop of Landaff. For a collection which cannot fail of being eminently conducive to the instruction and improvement of younger clergymen, and for the noble, manly, and truly evangelical preface by which it is preceded, this great prelate is entitled to the gratitude of the Christian world." It may not be improper to add, that the Supplement to the Credibility has been published separately by the booksellers, under the title of the History of the Gospels and Epistles.

Applauded as Dr Lardner's works were, he received little recompense for them. Some of the latter volumes of the Credibility were published at a loss; and at last he sold the copyright and all the remaining printed copies to the booksellers, for the trifling sum of L.150. His object, however, was not private emolument, but to serve the interests of truth and virtue; and it pleased divine providence to spare his life, both to complete his extensive plan, and to see the last volume, the fourth of the Testimonies, published. This was in 1767. But he was seized with a decline in the following summer, and carried off in a few days, at Hawkhurst, the place of his nativity, where he had a small paternal estate. He died in the eighty-fifth year of his age.

LARENTINALIA, in *Antiquity*, a feast held amongst the Romans on the 23d day of December, but ordered to be observed twice a year by Augustus. It was supposed by some to have been instituted in honour of the Lares, but by others, with more probability, in honour of Acca Laurentia, and to have been the same with Laurentalia.

LARES, amongst the ancients, derived by Apuleius from *lar familiaris*, a kind of domestic genii or divinities, worshipped in houses, esteemed the guardians and protectors of families, and supposed to reside more immediately in the chimney corner. The Lares were distinguished from the Penates, as the former were supposed to preside over housekeeping, the servants in families, and domestic affairs; whilst the latter were the protectors of the masters of families, their wives, and children. Accordingly the Lares were dressed in short, succinct habits, to show their readiness to serve; and they held a sort of cornucopia in their hands, as a signal of hospitality and good housekeeping. According to Ovid, there were generally two of them, who were sometimes represented with a dog at their feet. Plutarch distinguishes good and evil Lares, as he had before done good and evil genii. There are also some public, others private Lares. Apuleius tells us the domestic Lares were no more than the souls of departed persons, who had lived well, and had discharged the duties of their station;

whereas those who had done otherwise were vagabonds, wandering about and frightening people, called *Larvæ* and *Lemures*. The Lares were also called *Penates*, and were worshipped under the figures of little marmosets, or images of wax, silver, or earthen ware. The public Lares were also called *Compitales*, from *compitum*, a cross-way; and *Viales*, from *via*, a way or public road; as being placed at the meetings of roads and in the highways, and esteemed the patrons and protectors of travellers. The private Lares took care of particular houses and families, and were also called *Præstites*, from *præsto*. The Lares were likewise genial gods, and were supposed to take care of children from their birth. It is for this reason that, when Macrobius tells us the Egyptians had four gods who presided over the births of children, viz. Genius, Fortune, Love, and Necessity, called *Præstites*, some interpret him as if he had said the Egyptians had Lares, and they have mentioned that there was a great difference between the Lares of the Romans and the Præstites of the Egyptians. However, the learned Mr Bryant affirms that they were the same. The ancients differ extremely about the origin of the Lares. Varro and Macrobius say that they were the children of Mania; Ovid makes them the issue of Mercury, and the Naiad Lara or Larunda; Apuleius assures us that they were the posterity of the Lemures; Nigridius, according to Arnobius, makes them sometimes the guardians and protectors of houses, and sometimes the same with the Curetes of Samothracia, which the Greeks call *Idæi Dactyli*. Nor was Varro more consistent in his opinion of these gods; sometimes making them the manes of heroes, and sometimes gods of the air. Titus Tatius, king of the Sabines, was the first who built a temple to the Lares. The chimney and fire-place in the house were particularly consecrated to them. Tertullian is of opinion that the custom of worshipping the Lares arose from this, that they anciently interred their dead in their houses; and hence the credulous people took occasion to imagine that their souls continued there also, and thus proceeded to pay them divine honours. To this it may be added, that the custom being afterwards introduced of burying in the highways, they might hence take occasion to regard them as gods of the highways. The victim offered to the Lares in the public sacrifices was a hog; but in private they were offered wine, incense, a crown of wool, and a little of what was left at the table. They also crowned them with flowers, particularly the violet, myrtle, and rosemary. Their symbol was a dog, which was usually represented by their side, on account of its fidelity and the service it does to a man in watching his house. They were sometimes also represented as clothed in a dog's skin. The term *Lares*, according to Mr Bryant, was formed from *laren*, an ancient word by which the ark was represented. He supposes that the Lares and Manes were the same domestic deities under different names; and that by these terms the Etruscans and Latins denoted the *dii arkitæ*, who were no other than their arkite ancestors, or the persons preserved in the laren or ark, the genius of which was Isis, the reputed parent of the world. He observes further, that they are described as demons and genii, who once lived upon earth, and were gifted with immortality. Arnobius styles them *Lares quosdam genios et functorum animas*; and he says that, according to Varro, they were the children of Mania. Huetius (*Demonst. Prop.* iv. p. 139) adds, that Mania had also the name of Larunda; and that she is styled the mother of the demons. By some she is called Lara, and was supposed to preside over families; and children were offered at her altar in order to procure her favour. Instead of these, they offered in after times the heads of poppies and pods of garlic.

LARGE, a nautical term applied to the wind when it crosses the line of a ship's course in a favourable direction, particularly on the beam or quarter. Thus, if a ship steers west, then the wind in any point of the compass to the eastward of the south or north may be called *large*, unless when it is directly east, and then it is said to be right aft. Sailing large is, therefore, advancing with a large wind, so as that the sheets are slackened and flowing, and the bowlines entirely disused. This phrase is generally opposed to sailing close-hauled.

LARGITIO, in Roman antiquity, was a distribution of corn, provision, clothes, money, and the like, amongst the people. Gracchus, when tribune, in order to render himself popular, passed a law for supplying the Roman citizens with corn out of the public granaries at a very low rate. Claudius, another tribune, with the same view to popular applause, procured it to be distributed *gratis*. Cato, to win the common people from Cæsar, persuaded the senate to do the same; and three hundred thousand citizens shared in the distribution. Cæsar, after his triumph, extended his bounty to a hundred and fifty thousand, giving them each a mina. The Roman emperors enlarged still further the list of those who were to partake of their distributions. *Largitio* is frequently taken in a bad sense, to signify masked or secret bribery, by which candidates purchased votes when they stood for places of honour or trust in the state. The distribution of money was called *congiarium*, and the distributors *divisores* and *sequestres*.

LARGO, Upper and Nether, is the name of two small villages of Fifeshire, situated near the shore of the Frith of Forth. The former is a very agreeable place, about a mile from the sea, on the road between Leven and Anstruther. It has a parish church, an ancient Gothic fabric, with a spire rising from the middle. Nether Largo is an extensive fishing village, much resorted to as summer quarters. This was the birth-place of Alexander Selkirk, the accredited prototype of the fictitious Robinson Crusoe. The weaving of linen is a source of emolument both here and at Upper Largo.

LARGS, a small village on the west coast of Scotland, opposite to the island of Bute. It contains only about 500 inhabitants, but is rendered memorable by the defeat which the Norwegians sustained here, in their last invasion of Scotland.

LARISSA, a city of ancient Thessaly, in the Turkish province of Tirhala. It is situated on the river Salambria, the ancient Peneus, over which is a fine bridge of ten arches. It is surrounded with walls, and contains two large and twenty smaller mosques, several Greek churches, and 4000 houses, with 25,000 inhabitants. It is the greatest manufacturing town in the Turkish empire, producing silk and cotton goods, leather, and ironmongery. The environs are pleasant and fertile, yielding abundance of grapes, figs, raisins, and excellent corn and pulse; but the situation is marshy, and somewhat unhealthy. It is in long. 22. 46. E. and lat. 39. 48. N.

LARISTAN, a province of Persia, which extends along the northern shore of the Persian Gulf, from the fifty-fifth to the fifty-eighth degree of east longitude. It is bounded by Fars on the north-west, and Kerman on the north-east, and is the poorest and least productive province of Persia. The country is arid, and so destitute of wholesome water, that it would be uninhabitable were it not for the periodical rains, which fill the cisterns of the natives, and enable them to cultivate the date tree, together with a small quantity of wheat and barley. The coast is in possession of the different Arab tribes, who, under the government of their own sheiks, maintain their independence, and pay a trifling tribute to the king. They subsist chiefly by piracy, and reside in small towns or mud forts scattered along the shore of the gulf. The chief town, besides Lar, the capital, is Congoon, containing 6000 or 7000 inhabitants.

LARK. See Ornithology.

LARMIER, in *Architecture*, a flat square member of the cornice, below the cimasium, and jetting out farthest. It is so called from its use, which is to disperse the water, and cause it to fall at a distance from the wall, drop by drop, or as if by tears, the French word *larme* signifying a tear.

LARREK, a small island in the Persian Gulf, about fifteen miles in circumference, with a little conical hill in its centre. It has no harbour, and is destitute both of water and vegetation. It is ten miles south-west of Ormuz.

LARVA, in *Natural History*, a name given by Linnæus to insects in that state which is called by other writers *eruca* or *caterpillar*.

LARVÆ, in *Antiquity*, derived from the Etruscan word *lar* or *lars*, signifying "prince or lord," denoted the ghosts of the deceased, considered as wicked and mischievous. Hence is formed the term *larvatus*, that is, *larva indutus* or *demoniac*. The ingenious Mr Farmer urges the etymology and use of this term to prove that the heathen demons were human ghosts. The *larvæ* were also called *lemures*.

LARUS, the gull. See ORNITHOLOGY.

LASCARIS, CONSTANTINE, one of those illustrious Greeks who, having been expelled from their native country in the fifteenth century, contributed greatly to the revival of letters in Europe. He was descended of the imperial family of the same name, and born at Constantinople, though in what year has not been ascertained. In 1454, he left the imperial city, destined soon afterwards to become the prey of the Turkish invaders, and went to seek an asylum in Italy, where he was favourably received by Francisco Sforza, who intrusted him with the education of his daughter Hippolyta, afterwards married to Alfonzo king of Naples. From Milan he proceeded to Rome, where he lived some time in habits of intimacy with Cardinal Bessarion, and then set out for Naples, whither he had been invited by King Ferdinand, in order to profess Greek and rhetoric in that city. Having spent some years in this occupation, he formed the resolution of going to end his days in one of the isles of Greece; but the vessel in which he had embarked having touched at Messina, the principal inhabitants made to him such urgent applications, that he consented to give lessons in their city. The reputation of this great master of learning soon attracted thither numerous pupils, amongst whom the celebrated Bembo is said to have been one; and he received the honour of citizenship, which he merited equally by his virtues and his erudition. He lived to an advanced age, and died towards the end of the year 1493. In gratitude for the proofs of regard which he had received from the senate, he bequeathed to it, by his will, his library, consisting of valuable manuscripts, which were afterwards transported to Spain, where they may still be seen in the Royal Library of the Escurial. His published works are, 1. Grammatica Græca, sive Compendium octo Orationis partium, Milan, 1476, in 4to, being the first book printed in Greek; 2. Two *Opuscula* on the Sicilians and Calabrese who had written in Greek, published, for the first time, by Maurolico in 1562; 3. A Dissertation on Orpheus, printed in the first volume of the *Marmora Taurinensia*, from a manuscript in the library of the king of Sardinia. (A.)

LASCARIS, *Andrew John*, a learned Greek, of the same family with the preceding, and surnamed *Rhyndacenus*, probably because he was originally from Rhyndacus, a small town between the Hellespont and Phrygia. He abandoned his native country after the overthrow of the lower empire, and took refuge at the court of Lorenzo de' Medicis. This great protector of letters sent him back to the East to collect such manuscripts as had escaped the fury of the Turks; and having obtained permission to examine the libraries, he derived from them a great number of valuable works. Some years afterwards, he made a second voyage to Greece; but before his return Lorenzo died, and the troubles which broke out in Florence determined Lascaris to accept the offers made to him by Charles VIII. in order to draw him to France. He was at Paris in the year 1495; and it was he who taught the principles of the Greek language to Budé and to Danes. In 1503, Louis XII. appointed him to the embassy of Venice; a mission in which he must have acquitted himself in a satisfactory manner, since he was sent thither a second time in 1505. Nevertheless, Wicquefort pretends that Lascaris was but ill qualified for an employment which required a knowledge of the interests of princes, and great experience of the world; and he even asserts that the Venetians complained that France had sent them a pedant instead of an ambassador. His functions ceased in consequence of the rupture which took place between the republic and France; and Lascaris resumed the teaching of the Greek language. Leo X. having conceived the design of extending the knowledge of this language, called him to Rome, to put him at the head of the college of young Greeks which he had just founded; and at the same time confided to him the direction of a printing establishment destined to multiply impressions of Greek books. In 1515, the pope intrusted him with a mission to Francis I.; and this prince, sensible of his merits, endeavoured to retain him in France. Lascaris, however, returned to Rome the same year; but he revisited Paris in 1518, and, along with Budé, was employed to form the royal library of Fontainebleau. Francis I. then appointed Lascaris his ambassador to Venice, as his predecessor had done; and he remained in that city until Pope Paul III. testified a desire to have him at Rome. He yielded to the solicitations of the pontiff, though suffering from the gout, and immediately set out for the capital of the Christian world; but the fatigue of the journey augmented his sufferings, and he died, in 1535, a few months after his arrival, at the advanced age of nearly ninety. Lascaris did not deem it unworthy of him to act as corrector of the press, first in the office of F. Alopa at Florence, and next in the printing-house established by Pope Leo X. in Monte-Cavallo; and we are indebted to him for excellent editions of the following works, viz. I. Anthologia Epigrammatum Græcorum, libri vii. Græce, Florence, 1494, in 4to; 2. Callimachi Hymni Gr. cum scholiis Græcis, ibid. in 4to, the *editio princeps*, executed with the same characters as the preceding work; 3. Scholia Græca in Iliadem, in integrum restituta, Rome, 1517, in folio, a very rare edition; 4. Homericarum Quæstionum, liber, et de Nympharum antro in Odyssea opusculum, ibid. 1518, in small 4to, the *editio princeps;* 5. Commentarii [Græci] in septem Tragœdias Sophoclis, ibid. 1518, in small 4to. Lascaris wrote in Latin with equal facility and elegance; and he was entreated to undertake the translation of several Greek authors, but he has only rendered some treatises of Polybius on the military art. Several smaller works are also ascribed to him, viz. 1. Epigrammata Græca et Latina, Paris, 1527, in 8vo, and 1544, in 4to; 2. De veris Græcarum Litterarum formis ac causis apud Antiquos, Paris, 1536, in 8vo; 3. Orationes, Francfort, 1575. The *Nuova Scielta di Lettere*, by Bernardo Pino, contains one of Lascaris. (A.)

LASH, or LACE, in nautical language, signifies to bind or make fast; as, to lash the bonnet to the course, or the drabbler to the bonnets. The carpenter takes care that the spare yards are lashed fast to the ship's side; and in a rolling sea, the gunners mind that the guns are well lashed, lest they should break loose. Lashers are properly those ropes which bind fast the tackles and the breechings of the ordnance, when hauled or made fast within board.

LASPHE, a town of Prussian Westphalia, in the government of Arensburg, and circle of Witgenstein. It stands on the river Lahn, and contains 160 houses, with 1720 inhabitants, who are chiefly occupied in making iron wares. Adjoining to the city is the palace of Prince Witgenstein, whose dominions, now mediatised, extended over 170 square miles, and comprehended two towns, twenty-eight villages, and 120 houses, with 8800 inhabitants.

LASSA, a town of Thibet, and capital of a province of the same name. It is the capital of the country, and the seat of the Delai Lama. It belongs, however, to the Chinese, who have a viceroy here, with a garrison, commanded by a general officer, whose influence is superior to that of the lamas. It has been visited by few Europeans, and only by Catholic missionaries, who have left no very accurate or satisfactory description of it. The territory extends as far west as Kheroo, distant 350 miles west-south-west, which is within its limits. The city of Lassa is usually crowded with royal and noble personages from all parts of Asia, who come to present their homage, with splendid offerings, to the Delai Lama. His temple is crowned with a gilded dome, and adorned with numerous pyramids, either gilt or crowned with silver. Long. 91. 25. E. Lat. 29. 30. N.

LAST, in general, signifies the burden or load of a ship. It signifies also a certain measure of fish, corn, wool, leather, and the like. A last of cod-fish, white herrings, meal, and ashes for soap, is twelve barrels; of corn or rapeseed, ten quarters; of gunpowder, twenty-four barrels; of red herrings, twenty cades; of hides, twelve dozen; of leather, twenty dickers; of pitch and tar, fourteen barrels; of wool, twelve sacks; of stock fish, one thousand; of flax or feathers, 1700 lbs.

LASTAGE, or Lestage, a duty exacted in some fairs and markets, for carrying things bought whithersoever one pleases to order. It signifies also the ballast or lading of a ship, and is sometimes used for garbage, rubbish, or such like filth.

LASUS, or Lassus, a Greek poet and musician, respecting whom only a few facts have been transmitted to us. He was the son of Charbinus, a native of Hermione, in Argolis, and flourished about the sixty-ninth olympiad (B. C. 504), during the reign of Darius I. king of Persia. Some of the ancients put Lasus in the number of the seven wise men of Greece, to the exclusion of Periander of Corinth. He was the first who wrote on the theory of music, and joined example to precept, being also an excellent musician. According to Clemens of Alexandria, he was the inventor of dithyrambic verse; he was at least the first to introduce it at the public games, and instituted prizes for the successful candidates. (Suidas, *Aristoph. Schol. Vesp.* 1401.) We are informed by Herodotus (vii. 6), that Lasus caused the poet Onomacritus to be banished from Athens by Hipparchus, because he interpolated the poetry of Musæus with false prophecies. He was the contemporary of Simonides, and the instructor of Pindar. (*Thom. Mag. Vit. Pind.*) Athenæus (viii. 20) has preserved some witticisms of Lasus, which do not tend to raise him in our estimation. He quotes also a hymn to Ceres of Hermione, and an ode entitled the Centaurs, in neither of which he had made use of the letter S (x. 455; xiv. 624). (See *Les Remarques de Burette sur le Dialogue du Plutarque touchant la Musique*, in the *Mém. de l'Acad. des Inscrip.* xv. p. 324.)

LASWAREE, a small village of Hindustan, in the province of Delhi, the scene of a desperate battle fought between the British army and Scindia, in which the former obtained a complete victory.

LATERAN was originally the proper name of a man, from whom it descended to an ancient palace in Rome, and to the buildings since erected in its place, particularly a church called St John of Lateran.

Councils of the Lateran are those which were held in the basilica of the Lateran. Of these there have been five, which were held in 1123, 1139, 1179, 1215, and 1513, respectively.

Canons Regular of the Congregation of the Lateran is a congregation of regular canons, of which that church is the principal place or seat.

It is pretended that there has been an uninterrupted succession of clerks, living in community, from the time of the apostles; and that a number of these were established in the Lateran in the time of Constantine. But the canons were not introduced till the time of Leo I.; and these held the church eight hundred years, till the reign of Boniface, who took it from them, and placed secular canons in their room. A century and a half thereafter, the regulars were reinstated.

A LATERE, a term used to denote the qualifications of the cardinals whom the pope sends as legates into foreign countries. They are called "legates *a latere*," as being his holiness's assistants and counsellors in ordinary. They are the most considerable of all the legates, being such as the pope commissions to take his place in councils; and they are so called because he never confers this office on any but his favourites and confidants, who are always *a latere*, at his side. A legate *a latere* has the power of conferring benefices without a mandate, and of legitimating bastards; and a cross is carried before him as the ensign of his authority.

De Latere, legates who are not cardinals, but yet are intrusted with an apostolic legation.

LATEEN Sail, a long triangular sail extended by a lateen yard, and frequently used in xebecs, polacres, setees, and other vessels which navigate in the Mediterranean Sea.

LATH, in building, a long, thin, and narrow slip of wood nailed to the rafters of a roof or ceiling, in order to sustain the covering.

LATHAM, a township in the parish of Ormskirk, in the hundred of West Derby, in the county of Lancaster, 210 miles from London. The castle here formerly belonged to the Earls of Derby, and was boldly defended against the parliament forces in the civil war in 1648. There is a mineral spring, from which Epsom salt is made. The population amounted in 1801 to 2179, in 1811 to 2514, in 1821 to 2997, and in 1831 to 3272.

LATHE, a very useful engine for the turning of wood, ivory, metals, and other materials. The invention of the lathe is very ancient. According to Diodorus Siculus, the first who used it was a grandson of Dædalus, named Talus. Pliny ascribes it to Theodore of Samos, and mentions one Thericles, who rendered himself famous by his dexterity in managing the lathe. With this instrument the ancients turned all kinds of vases, many of which they enriched with figures and ornaments in bas-relief. The Greek and Latin authors make frequent mention of the lathe; and Cicero calls the workmen who used it *vascularii*. It was a proverb amongst the ancients, to say a thing was formed in the lathe, in order to express its delicacy and justness. The lathe is composed of two wooden cheeks or sides, parallel to the horizon, having a groove or opening between, and perpendicular to these are two other pieces called *puppets*, made to slide between the cheeks, and to be fixed down at any point at pleasure. These have two points, between which the piece to be turned is sustained. The piece is turned round backwards and forwards by means of a string put round it, and fastened above to the end of a pliable pole, and underneath to a treadle or board moved with the foot. There is also a rest which bears up the tool, and keeps it steady. As it is the use and application of this instrument that forms the greatest part of the art of turning, we refer for the particular description of it, as well as the manner of applying it in various works, to that head. See TURNING.

LATHREVE, LEIDGREVE, or TRITHENGREVE, was an officer under the Saxon government, who had authority over a third part of the county, and whose territory was therefore called *trithing*, otherwise a *leid* or *leithin*, in which manner the county of Kent is still divided. As to the jurisdiction of this officer, those matters which could not be determined in the hundred court were thence brought to the trithing, where all the principal men of the three or more hundreds being assembled by the *lathreve* or *trithingreve*, debated and decided it; or if they could not, then the *lathreve* sent it up to the county court, to be there finally determined.

LATIAR, in Roman antiquity, a feast or ceremony instituted by Tarquinius Superbus, in honour of Jupiter Latiaris or Latialis.

LATICLAVE (*Laticlavium*), in Roman antiquity, was an honourable distinction, peculiar, in the times of the republic, to the senators; but whether it was a particular kind of garment, or only an ornament upon it, the critics are not agreed. The more general opinion, however, is, that it was a broad stripe of purple sewed upon the fore part of the tunic, and round the middle of the breast. There were buttons set on the *latus clavus* or *laticlave*, which appeared like the heads of large nails, from which some think it derived its name. The senators, prætors, and chief magistrates of colonies and municipal cities, had a right to wear it. The prætexta was always worn over it; but when the prætor pronounced sentence of death, the prætexta was then put off, and the laticlave retained. The *laticlavium* differed from the *angusticlavium;* but authors do not agree in what this difference consisted. The most general opinion, however, seems to be, that the slips or stripes of purple were narrower in the angusticlave.

LATIMER, HUGH, bishop of Worcester, was born about the year 1480, at Thurcaston, in Leicestershire. He was the only son of a yeoman of that village. At the age of fourteen he was sent to Christ's College, Cambridge, where he applied himself to the study of divinity, and in proper time took the degree of bachelor in that science. At this time he was a zealous Catholic, and was honoured with the office of keeper of the cross to the university; but when he was about thirty years of age, he became a convert to the Protestant religion; and being then one of the twelve licensed preachers of Cambridge, he promulgated his opinions with great freedom. It was not long before he was accused of heresy; and being summoned before Cardinal Wolsey, he was obliged to subscribe certain articles of faith, which he certainly did not believe. About the year 1529 he was presented by the king to the rectory of Westkinton, in Wiltshire, to which place, after residing some time at court with his friend and patron Dr Butts, he retired; but having resumed his former invectives against the Catholic doctrines, he was again summoned to answer certain interrogatories, and again obliged to subscribe a recantation. In 1535, he was promoted to the bishopric of Worcester, a dignity which he continued to enjoy till the year 1539, when, rather than assent to the act of the six articles, he resigned his mitre, and retired into the country; but in a short time he was accused of speaking against the six articles, and committed to the Tower, where he continued prisoner till the death of Henry VIII. which happened in January 1547. On the accession of Edward VI. Latimer was released, but not restored to his bishopric, though he had preached several times before the king, and continued to exercise his ministerial functions with unremitting zeal and resolution. But young Edward finished his short reign in the year 1553; and Mary having ascended the throne, Latimer was immediately doomed to destruction, and, together with Cranmer and Ridley, confined in the Tower. In April 1554, they were removed to Oxford, that they might dispute with the learned doctors of both universities. Latimer declined the disputation on account of his great age and infirmities, but delivered his opinion in writing; and, having refused to subscribe the Romish creed, was condemned for heresy, and, in the October following, burned alive, along with Bishop Ridley. He behaved with uncommon fortitude on the occasion, and died a real martyr to the Reformation. His general character is that of a learned, virtuous, and brave man. His works are, 1. Sermons, 1635, in folio; 2. Letters in Fox's Acts and Monuments (vol. ii.), 1580; 3. An Injunction to the Prior and Convent of St Mary's in Worcestershire.

LATIN, a dead language, first spoken in Latium, and afterwards at Rome. See LANGUAGE and PHILOLOGY.

LATINUS, king of the Latins in Italy, was the son of Faunus, and, it is said, began to reign about 1216 years before the Christian era. Lavinia, his only daughter, married Æneas, after that Trojan prince had killed Turnus king of the Rutulians.

LATISANA, a town of Italy, the capital of a district in the Austrian delegation of Frioul, on the river Tagliamento. There is a fine palace belonging to the Mocenego family. It contains 3890 inhabitants, whose trade is chiefly in timber. Long. 13. 8. 40. E. Lat. 45. 54. 10. N.

LATITUDE, in *Astronomy*, is the distance of a star north or south from the ecliptic. In geography it signifies the distance of any place north or south from the equator. See ASTRONOMY, and GEOGRAPHY, *passim*.

LATITUDINARIAN, a person of moderation respecting religious opinions, who believes there is a latitude in the road to heaven, which may admit people of different persuasions.

LATIUM, in *Ancient Geography*, the country of the Latins, at first contained within very narrow bounds, but afterwards increased by the accession of various tribes and races. The appellation, according to Virgil, is *a latendo*, from Saturn's lying hid there from the hostile pursuit of his son Jupiter; and from *Latium* comes *Latini*, the name of the people, though Dionysius of Halicarnassus derives it from King Latinus, who reigned about the time of the Trojan war. But, be this as it may, it is certain, that Latium, when under Æneas and his descendants, or the Alban kings, contained only the Latins, exclusive of the Æqui, Volsci, Hernici, and other people; but that Æneas reckoned the Rutulians, after their conquest, amongst the Latins. And this constituted the ancient *Latium*, confined to the Latins; but afterwards, under the kings, and subsequently, it reached from the Tiber to Circeii. Under the consuls, the country of the Æqui, Volsci, Hernici, and others, after long and bloody wars, was added to Latium, under the appellation of *adjectitious* or *superadded Latium*, as far as the river Liris, the eastern boundary, and to the north as far as the Marsi and Sabines. The various people which in succession occupied Latium, were the aborigines, the Pelasgi, the Arcades, the Siculi, the Arunci, the Rutuli; and beyond Circeii, the Volsci, the Osci, and the Ausones; but the question as to who first, and who next, occupied the country, it is exceedingly difficult to resolve.

LATMUS, in *Ancient Geography*, a mountain of Ionia, or on the confines of Caria, famous for the fable of Endymion, of whom the Moon was said to be enamoured: hence called *Latmius Heros*, and *Latmius Venator*.

LATOMIA properly signifies a *stone quarry;* but the places whence stones had been dug having been made use of sometimes as dungeons, jails, or prisons for criminals, it is often applied as a name for a prison. There was a place of confinement of this sort at Rome, near the Tullianum, and another at Syracuse, in which Cicero says Verres had shut up Roman citizens.

LATONA, in *Mythology*, a goddess, whose history is very obscure. Hesiod makes her the daughter of Titan Coeus, and Phœbe his sister. She was admired for her beauty, and celebrated for the favours which she granted to Jupiter. Juno, always jealous of her husband's amours, made Latona the object of her vengeance, and sent the serpent Python to disturb her peace and persecute her. Latona wandered from place to place during the time of her pregnancy, continually alarmed for fear of Python. She was driven from heaven; and Terra, influenced by Juno, refused to give her a place where she might rest and bring forth. Neptune, moved with compassion, struck with his trident and made immoveable the island of Delos, which had before wandered in the Ægean, appearing sometimes above and sometimes below the surface of the sea. Latona, changed into a quail by Jupiter, came to Delos, where she resumed her original shape, and gave birth to Apollo and Diana, leaning against a palm tree or an olive. But her repose was of short duration. Juno discovered the place of her retreat, and obliged her to fly from Delos. She wandered over the greater part of the world; and in Caria, where her fatigue compelled her to stop, she was insulted and ridiculed by the peasants, of whom she asked for water whilst they were weeding a marsh. Their refusal and insolence provoked her, and she entreated Jupiter to punish their barbarity. They were all changed into frogs. She was also insulted by Niobe, who boasted herself greater than the mother of Apollo and Diana, and ridiculed the presents which the piety of her neighbours had offered to Latona. At last, Latona, though persecuted and exposed to the resentment of Juno, became a powerful deity, and saw her children receive divine honours. Her worship was generally established where her children received adoration; particularly at Argos, Delos, and other places, where she had temples. She had an oracle in Egypt, celebrated for the true and decisive answers which it gave. Latona, Venus, and Diana, were the three goddesses most in veneration amongst the Roman women.

LA TOUR DU PIN, an arrondissement of the department of the Isère, in France, 556 square miles in extent. It comprehends eight cantons, divided into 125 communes, and contains 106,500 inhabitants. The capital is the city of the same name, situated in a pleasant valley on the river Bourbon, but containing only 1550 inhabitants.

LATRINÆ were public houses, or necessaries, amongst the Romans. We do not find, in the writings or buildings that remain of antiquity, that they had any such in their dwellings.

LATRUNCULI, a game amongst the Romans, of much the same nature with our chess. The *latrunculi* were properly the chess-men, called also *latrones* and *calculi*. They were usually made of glass, and distinguished by black and white colours; but sometimes they were made of wax or other convenient substances. The invention of this game is by some ascribed to Palamedes when at the siege of Troy; Seneca attributes it to Chilon, one of the seven Grecian sages; others honour Pyrrhus with the invention; and others again contend that it is of Persian origin. But is not this *lis de lana caprina?* Frequent allusions to this game are met with in the Roman classics; and a little poem was written upon it, addressed to Piso, which some say was the work of Ovid, others of Lucan, in the end of some editions of whose works it is to be found, and to which we refer for a fuller account of the game. This game expresses so well the chance and order of war, that it is, with great appearance of probability, attributed to some military officer as the inventor. One Canius Julius was so exceedingly fond of chess, that after he was sentenced to death by Caligula, he was found playing, and was interrupted in his game by a call to execution; he obeyed the summons, but first desired the centurion who brought the fatal order, to bear witness that he had one man upon the board more than his antagonist, that he might not falsely brag of victory when he should be no more.

LATTALATTA, one of the small islands adjacent to Gilolo, and about twenty-five miles in circumference. It is separated from the island of Jappa by a strait above a mile and a half in length, and in some places not above forty-six yards broad, in others eight miles. There is also a cluster of small islands lying off the west coast of Gilolo, a few minutes to the north of the equinoctial line, and about the 127th degree of east longitude.

LATTEN denotes iron plates tinned over, of which tea-cannisters are made. Plates of iron being prepared of a proper thinness, are smoothed by rusting them in an acid liquor, as common water made eager with rye. With this liquor they fill certain troughs, and then put in the plates, which they turn once or twice a day, that they may be equally rusted over. After this they are taken out, and well scoured with sand; and, to prevent their rusting again, are immediately plunged into pure water, in which they are to be left till the instant they are to be tinned or blanched. The manner of doing this is as follows: They flux the tin in a large iron crucible, which has the figure of an oblong pyramid with four faces, of which two opposite ones are less than the two others. The crucible is heated only from below, its upper part being luted with the furnace all round. The crucible is always deeper than the plates which are to be tinned are long; they always put them in downright, and the tin ought to swim over them; to this purpose artificers of different trades prepare plates of different shapes, though M. Reaumur thinks them all exceptionable. But the Germans use no sort of preparation of the iron to make it receive the tin, more than the keeping it always steeped in water till the time; only when the tin is melted in the crucible, they cover it with a layer of a sort of suet, which is usually two inches thick, and the plate must pass through this before it can come to the melted tin. The first use of this covering is to keep the tin from burning; for if any part should take fire, the suet would soon moisten it, and reduce it to its primitive state again. The blanchers say, this suet is a compound matter. It is indeed of a black colour; but M. Reaumur supposed that to be only an artifice to make it a secret, and that it is only coloured with soot or the smoke of a chimney. But he found it true so far, that the common unprepared suet was not sufficient; for after several attempts, there was always something wanting to render the success of the operation certain. The whole secret of blanching, therefore, was found to lie in the preparation of the suet; and this at length he discovered to consist only in the first frying and burning it. This simple operation not only gives it the colour, but puts it in a condition to give the iron a disposition to be tinned, which it does surprisingly.

The melted tin must also have a certain degree of heat. For if it be not hot enough, it will not stick to the iron; and if it be too hot, it will cover it with too thin a coat, and the plates will have several colours, as red, blue, and purple, and, upon the whole, will have a cast of yellow. To prevent this, by knowing when the fire has a proper degree of heat, they might try with small pieces of iron; but, in general, use teaches them to know the degree, and they put in the iron when the tin is at a different standard of heat, according as they would give it a thicker or thinner coat. Sometimes also they give the plates a double layer, as they would have them very thickly covered. This they do by dipping them into the tin when very hot the first time, and when less hot the second. The tin which is to give the second coat must be fresh covered with suet; and that with the common suet, not the prepared.

LATTEN *Brass*, plates of milled brass reduced to different thickness, according to the uses they are intended for.

LAUBAN, a city, the capital of a circle of the same name, in Prussian Silesia, within the government of Liegnitz. It stands on the Queis, is walled, and contains four churches and 784 houses, inhabited by 4560 persons. Many are employed in making linen and woollen goods and hosiery. A celebrated convent of St Mary Magdalen existed here till 1817, when it was dissolved; its estates comprised six large villages, and 8800 inhabitants.

LAUD, William, archbishop of Canterbury in the seventeenth century, was born at Reading in 1573, and educated in St John's College, Oxford, of which he was afterwards a fellow and reader. In 1610, he took orders. In 1611, he was elected president of St John's College; but his election being disputed, it was confirmed by his majesty. The same year he was sworn the king's chaplain. In 1621, he was nominated bishop of St David's. In 1628, he was translated to the bishopric of London. In 1630, he was elected chancellor of the University of Oxford. In 1633, he attended the king into Scotland, and was sworn a privy councillor of that kingdom. During his stay in Scotland, he formed the resolution of bringing the church of that country to an exact conformity with the church of England. In the same year he succeeded Archbishop Abbot in the see of Canterbury; and soon afterwards came out his majesty's declaration about lawful sports on Sundays, which the archbishop was charged with having revived and enlarged, besides encouraging the vexatious prosecutions of such clergymen as refused to read it in their churches. In 1634–35, the archbishop was put into the great committee of trade and the king's revenue; on the 4th of March following, he was appointed one of the Commissioners of the Treasury; and on the 6th of March 1635–36, he received the staff of lord high treasurer of England. In order to prevent the printing and publishing of what he thought improper books, he procured a decree to be passed in the Star-chamber, on the 11th of July 1637, by which it was enjoined that the master printers should be reduced to a certain number, and that none of them should print any books until they were licensed either by the archbishop or the bishop of London, or by some of their chaplains, or by the chancellors or vice-chancellors of the two universities. A new parliament being summoned, met on the 13th of April 1640, and the convocation assembled the day following; but the Commons launching out into complaints against the archbishop, and insisting upon a redress of grievances before they granted any supply, the parliament was dissolved on the 7th of May. The convocation, however, continued sitting, and made seventeen canons, which were supposed to be formed under the immediate direction of the archbishop. In the beginning of the long parliament he was attacked on account of those canons, which were condemned by the House of Commons on the 16th of December 1640, "as containing many things contrary to the king's prerogative, to the fundamental laws and statutes of this realm, to the rights of parliament, to the property and liberty of the subject, and tending to sedition, and of dangerous consequence." On the 18th of December, he was accused by the Commons of high treason, and committed to the Tower. Being tried before the House of Lords, for endeavouring to subvert the laws, and to overthrow the Protestant religion, he was found guilty, and beheaded on Tower-hill on the 10th of January following, in the seventy-second year of his age. Laud was temperate in his diet, and regular in his private life; but his fondness for introducing new ceremonies, in which he showed a hot and indiscreet zeal, his encouraging of sports on Sundays, his illegal and cruel severity in the Star-chamber and High Commission Courts, and the fury with which he persecuted the dissenters, and all who presumed to contradict his sentiments, exposed him to popular hatred. The following is a correct list of his works, viz. 1. Seven Sermons preached on several occasions, 1651, in 8vo; 2. Short Annotations upon the Life and Death of the most August King James; 3. Answer to the Remonstrance made by the House of Commons in 1628; 4. His Diary by Wharton in 1694, with six other pieces, and several letters, especially one to Sir Kenelm Digby on his embracing Popery; 5. The second volume of the Remains of Archbishop Laud, written by himself, 1700, in folio; 6. Officium Quotidianum, or a Manual of Private Devotions, 1650, in 8vo; 7. A Summary of Devotions, 1667, in 12mo. About eighteen Letters of Laud to Gerard John Vossius have been printed by Colomesius in his edition of *Vossii Epistolæ*, London, 1690, in folio; some others are published at the end of the Life of Usher by Parr, 1686, in folio; and a few more have been inserted by Dr Twells in his Life of Dr Pococke, prefixed to the theological works of that author, 1645, in two vols. folio.

LAUDATIO, in a legal sense, was anciently the testimony delivered in court, to the good behaviour and integrity of life of the person accused. It resembled the custom which prevails in our trials, of calling persons to speak to the character of the prisoner. The least number of the *laudatores* amongst the Romans was ten.

LAUDER, William, a native of Scotland, was educated at the University of Edinburgh, where he finished his studies with great reputation, and acquired a considerable knowledge of the Latin tongue. On the 22d of May 1734, he received a testimonial from the heads of the university, certifying that he was a fit person to teach humanity in any school or college whatsoever. In 1739 he published at Edinburgh an edition of Johnston's Psalms. In 1742, he was recommended by Mr Patrick Cumming and Mr Colin Maclaurin, the professors of church history and mathematics, to the mastership of the grammar school at Dundee, then vacant. Whether he succeeded in his application or not, is uncertain; but a few years afterwards we find him in London, contriving to ruin the reputation of Milton, by an attempt which ended in the destruction of his own. His reason for the attack probably sprung from the virulence of party-spirit, which triumphed over every principle of honour and honesty. He began, in 1747, to retail part of his design in the Gentleman's Magazine; and, finding that his forgeries were not detected, he was encouraged in 1751 to collect them, with additions, into a volume, entitled An Essay on Milton's Use and Imitation of the Moderns in his Paradise Lost, in 8vo. But the fidelity of his quotations had been doubted by several people; and the falsehood of them was soon afterwards demonstrated by Dr Douglas, in a pamphlet entitled Milton Vindicated from the Charge of Plagiarism brought against him by Lauder, and Lauder himself convicted of several Forgeries and gross Impositions on the Public, in a Letter humbly addressed to the Right Honourable the Earl of Bath, 1751, in 8vo. The appearance of this detection overwhelmed Lauder with confusion. He subscribed a confession, dictated by a learned friend, in which he ingenuously acknowledged his offence, which he professed to have been occasioned by the injury he had received from the disappointment of his expectations of profit from the publication of Johnston's Psalms. This misfortune he ascribed to a couplet in Mr Pope's Dunciad (book iv. ver. 3), and thence originated his rancour against Milton. But he afterwards imputed his conduct to other motives, abused the few friends who continued to countenance him, and, finding that his character was not to be retrieved, quitted the kingdom, and went to Barbadoes, where for some time he taught a school. His behaviour there, however, was mean and despicable. He passed the remainder of his life in universal contempt; and died unregretted by any one, some time about the year 1771.

LAUDICOENI, amongst the Romans, applauders, who for reward entered the rehearsal-rooms, attended the repetition of plays, and were in waiting when orations were pronounced, to raise or increase the acclamation and applause.

LAUDOHN, Field-Marshal, a celebrated general in the imperial service, born in 1716, was a native of Livonia, and descended from a Scotch family. He made his first campaigns under Marshal Munich, in the war of 1738, between the Russians and Turks, and was present at the taking of Oczakow, as well as at Choczim, and Stawutzchane, where the Turks were entirely defeated. In 1741 Frederick the Great refused to take young Laudohn into his service, saying he did not like his countenance; but this monarch, who was considered as the greatest general of his age, afterwards observed that he had often admired the positions of other generals, but that he had ever dreaded the battles of Laudohn. In 1756, when but just entered into the service of the house of Austria, with the rank of lieutenant-colonel, he made such rapid progress, that within less than a year he became a general of artillery, and within three years commander-in-chief of the army. He rescued Olmutz when besieged by the Prussians, beat the king himself at Frankfort-on-the-Oder, took General Fouquet prisoner at Zorndorf, carried Glatz and Schweidnitz by assault, and stopped the progress of Frederick in a war which might have proved fatal to the house of Austria. In 1778, when elevated to the rank of field-marshal, at the head of sixty thousand men, he prevented Henry, brother to the king of Prussia, from joining his army to that of the king. At Dubicza, Novi, Grandisca, and Belgrade, in the war between the emperor and the Turks, he had but to present himself before the enemy, and say with Cæsar, *Veni, vidi, vici.* But at his head-quarters in Moravia he was seized with a fever, in consequence of an operation he underwent for an obstruction in the urethra. His impatience under the medical applications, the impetuous ardour of his character, and, above all, the knowledge of his importance in the war, contributed to irritate his mind, and promote the violence of the fever. He resisted the application of cataplasms, before and after the incisions were made, with a fatal obstinacy, which raised the inflammation to such a height, that he expired under an access of fever, on the 14th of July 1790, in the seventy-fourth year of his age.

LAUDS, Laudes, the second part of the ordinary office of the breviary, said after matins, though heretofore it ended the office of the night. The laudes consist principally of psalms, hymns, and the like, and hence they took their name from *laus, laudis*, praise.

LAUENBURG, a duchy in Germany, formerly a part of Hanover, but at the congress of Vienna transferred to Denmark. It extends in longitude from 9. 56. to 10. 37. E. and in latitude from 53. 21. to 53. 48. N., and contains 443 square miles, with one city, one town, and 123 villages, with 34,650 inhabitants. It borders on the Elbe, where there are some rich meadows; but the greater part of the duchy is a poor and sandy soil, yielding little grain excepting rye. There are some extensive woods in the western parts, which afford good oak and beech timber. There are few even of domestic manufactures beyond the spinning of flax, and very little commerce of any kind; and the roads are in the present day by far the worst which are to be met with in Germany. The capital is a city of the same name, situated on the river Elbe, where the Stecnitz falls into that stream. It is an ancient town, with pleasant walks on the side of the smaller river, and contains 460 houses, with 2980 inhabitants. It was built in the year 1157, by Henry the Lion, duke of Saxony, and was the residence of a member of that family till 1697. The church contains many monuments of that race, and has a lofty tower visible over a large circle. Long. 10. 17. 10. E. Lat. 53. 21. 5. N.

LAUFFEN, a city of the kingdom of Wirtemberg, in the circle of the Neckar. It stands on the river of the same name, and contains three churches, 600 houses, and 3630 inhabitants, who grow wine, and have some manufactures.

LAUGHARNE, a market-town of South Wales, in the county of Carmarthen, and hundred of Derlis, 223 miles from London. It stands at the mouth of the river Towy. The market is held on Saturday. The population amounted in 1801 to 1484, in 1811 to 1561, in 1821 to 1953, and in 1831 to 2020.

LAUGHTER, an affection peculiar to mankind, occasioned by something that tickles the fancy.

In laughter the eye-brows are raised about the middle, and drawn down next the nose; the eyes are almost shut; the mouth opens and shows the teeth, the corners of the mouth being drawn back and raised up; the cheeks seem puffed up, and almost hide the eyes; the face is usually red; the nostrils are open; and the eyes are moistened.

Authors attribute laughter to the fifth pair of nerves, which, sending branches to the eye, ear, lips, tongue, palate, and muscles of the cheek, part of the mouth, præcordia, &c. there hence arises a sympathy, or consent, between all these parts; so that when one of them is acted upon, the others are proportionally affected. Hence a savoury thing seen or smelt affects the glands and part of the mouth; a thing seen or heard that is shameful, affects the cheeks with blushes; on the contrary, if it please and tickle the fancy, it affects the præcordia and muscles of the mouth and face with laughter; if it cause sadness and melancholy, it likewise affects the præcordia, and demonstrates itself by causing the glands of the eyes to emit tears. Dr Willis accounts for the pleasure of kissing from the same cause; the branches of this fifth pair being spread to the lips, the præcordia, and the genital parts, hence arises a sympathy between these parts.

The affection of the mind by which laughter is produced is seemingly so very different from the other passions with which we are endowed, that it has engaged the attention of very eminent persons to discover it. Aristotle, in the fifth chapter of his Poetics, observes of comedy, that "it imitates those vices or meannesses only which partake of the ridiculous;" but "the ridiculous," says he, "consists of some fault or turpitude not attended with great pain, and not destructive." "The passion of laughter," says Hobbes, "is nothing else but sudden glory arising from some sudden conception of some eminency in ourselves, by comparison with the infirmity of others, or with our own formerly. For men," continues he "laugh at the follies of themselves past, when they come suddenly to remembrance, except when they bring with them any sudden dishonour." Akenside, in the third book of his poem, treats of ridicule at considerable length. He gives a detail of ridiculous characters; ignorant pretenders to learning, boastful soldiers, and lying travellers; hypocritical churchmen, conceited politicians, and old women that talk of their charms and virtue; ragged philosophers who rail at riches, virtuosi intent upon trifles, romantic lovers, wits wantonly satirical, fops that out of vanity appear to be diseased and profligate, dastards who are ashamed or afraid without reason, and fools who are ignorant of what they ought to know. Having finished the detail of characters, he makes some general remarks on the cause of ridicule, and explains himself more fully in a definition in prose, illustrated by examples. "That which makes objects ridiculous," he observes, "is some ground of admiration or esteem connected with other more general circumstances comparatively worthless or deformed: or it is some circumstance of turpitude or deformity connected with what is in general excellent or beautiful; the inconsistent properties existing either in the objects themselves, or in the apprehension of the person to whom they relate, belonging always to the same order or class of being, implying sentiment and design, and exciting no acute or vehement commotion of the heart." Hutcheson has given another account of the ludicrous quality, and seems to think that it is the contrast or opposition of dignity and meanness which occasions laughter.

But all these opinions are combated by Dr Beattie in his *Essay on Laughter and Ludicrous Composition.* "To provoke laughter," says he, "is not essential either to wit or humour. For though that unexpected discovery of resemblance between ideas supposed dissimilar, which is called *wit,* and that comic exhibition of singular characters, sentiments, and imagery, which is denominated *humour,* do frequently raise laughter, they do not raise it always. Addison's poem to Sir Godfrey Kneller, in which the British kings are likened to heathen gods, is exquisitely witty, and yet not laughable. Pope's *Essay on Man* abounds in serious wit; and examples of serious humour are not uncommon in Fielding's *History of Parson Adams,* and in Addison's account of Sir Roger de Coverley. Wit, when the subject is grave, and the allusions sublime, raises admiration instead of laughter; and if the comic singularities of a good man appear in circumstances of real distress, the imitation of these singularities in the epic or dramatic comedy will form a species of humour, which, if it should force a smile, will draw forth a tear at the same time. An inquiry, therefore, into the distinguishing characters of wit and humour has no necessary connection with the present subject.

"Some authors have treated of ridicule, without marking the distinction between *ridiculous* and *ludicrous* ideas. But I presume the natural order of proceeding in this inquiry, is to begin with ascertaining the nature of what is *purely ludicrous.* Things *ludicrous* and things *ridiculous* have this in common, that both excite laughter; but the former excite pure laughter, the latter excite laughter mixed with disapprobation and contempt. My design is to analyze and explain that quality in things or ideas which makes them provoke *pure laughter,* and entitles them to the name of *ludicrous* or *laughable.*

"When certain objects, qualities, or ideas, occur to our senses, memory, or imagination, we smile or laugh at them, and expect that other men should do the same. To smile on certain occasions is not less natural than to weep at the sight of distress, or cry out when we feel pain.

"There are different kinds of laughter. As a boy, passing by night through a churchyard, sings or whistles in order to conceal his fear, even from himself; so there are men who, by forcing a smile, endeavour sometimes to hide from others, and from themselves too, perhaps, their malevolence or envy. Such laughter is unnatural. The sound of it offends the ear; the features distorted by it seem horrible to the eye. A mixture of hypocrisy, malice, and cruel joy, thus displayed on the countenance, is one of the most hateful sights in nature, and transforms the 'human face divine' into the visage of a fiend. Similar to this is the smile of a wicked person pleasing himself with the hope of accomplishing his evil purposes. Milton gives a striking picture of it in that well-known passage:

> He ceas'd; for both seem'd highly pleas'd; and Death
> Grinn'd horrible a ghastly smile, to hear
> His famine should be fill'd, and blest his maw
> Destin'd to that good hour.

But enough of this. Laughter that makes a man a fiend or a monster I have no inclination to analyze. My inquiries are confined to that species of laughter which is at once natural and innocent.

"Of this there are two sorts. The laughter occasioned by tickling or gladness is different from that which arises on reading the *Tale of a Tub.* The former may be called *animal laughter,* the latter, if it were lawful to adopt a new word which has become very common, I should term *sentimental.* Smiles admit of similar divisions. Not to mention the scornful, the envious, the malevolent smile, I would only remark, that of the innocent and agreeable smile there are two sorts. The one proceeds from the risible emotion, and has a tendency to break out into laughter. The other is the effect of good humour, complacency, and tender affection. This last sort of smile renders a countenance amiable in the highest degree. Homer ascribes it to Venus in an epithet (φιλομμειδης) which Dryden and Pope, after Waller, improperly translate *laughter-loving;* an idea that accords better with the character of a romp or hoyden than with the goddess of love and beauty.

"Animal laughter admits of various degrees; from the gentle impulse excited in a child by moderate joy, to that terrifying and even mortal convulsion which has been known to accompany a change of fortune. This passion may, as well as joy and sorrow, be communicated by sympathy; and I know not whether the entertainment we receive from the playful tricks of kittens and other young animals, may not in part be resolved into something like a fellow-feeling of their vivacity. Animal and sentimental laughter are frequently blended; but it is easy to distinguish them. The former is often excessive; the latter never, unless heightened by the other. The latter is always pleasing, both in itself and in its cause; the former may be painful in both. But their principal difference is this: The one always proceeds from a sentiment or emotion exited in the mind, in consequence of certain ideas or objects being presented to it, of which emotion we may be conscious, even when we suppress laughter; the other arises not from any sentiment or perception of ludicrous ideas, but from some bodily feeling or sudden impulse on what is called the *animal spirits,* proceeding, or seeming to proceed, from the operation of causes purely material. The present inquiry regards that species that is here distinguished by the name of *sentimental laughter.*

"The pleasing emotion, arising from the view of ludicrous ideas, is known to every one by experience; but, being a simple feeling, admits not of definition. It is to be distinguished from the laughter that generally attends it, as sorrow is to be distinguished from tears; for it is often felt in a high degree by those who are remarkable for gravity of countenance. Swift seldom laughed, notwithstanding his uncommon talents in wit and humour, and the extraordinary delight he seems to have had in surveying the ridiculous side of things. Why this agreeable emotion should be accompanied with laughter as its outward sign, or sorrow express itself by tears, or fear by trembling or paleness, I cannot ultimately explain, otherwise than by saying, that such is the appointment of the Author of nature. All I mean by this inquiry is to determine, What is peculiar to those things which produce laughter, or, rather, which raise in the mind that pleasing sentiment or emotion whereof laughter is the external sign.

"Philosophers have differed in their opinions concerning this matter. In Aristotle's definition, quoted above, it is clear that he means to characterize, not laughable qualities in general (as some have thought), but the objects of comic ridicule only; and in this view the definition is just, however it may have been overlooked or despised by comic writers. Crimes and misfortunes are often in modern plays, and were sometimes in the ancient, held up as objects of public merriment; but if poets had that reverence for nature which they ought to have, they would not shock the common sense of mankind by so absurd a representation. The definition from Aristotle does not, however, suit the general nature of ludicrous ideas; for it will appear by and by, that men laugh at that in which there is neither fault nor turpitude of any kind.

"The theory of Mr Hobbes would hardly have deserved notice, if Addison had not spoken of it with approbation in the 47th paper of the *Spectator*. He justly observes, after quoting the words of Mr Hobbes formerly mentioned, that, 'according to this account, when we hear a man laugh excessively, instead of saying that he is very merry, we ought to tell him that he is very proud.' It is strange that the elegant author should be aware of this consequence, and yet admit the theory; for so good a judge of human nature could not be ignorant, that laughter is not considered as a sign of pride; persons of singular gravity being often suspected of that vice, but great laughers seldom or never. When we see a man attentive to the innocent humours of a merry company, and yet maintain a fixed solemnity of countenance, is it natural for us to think that he is the humblest, and the only humble person in the circle?

"Another writer in the *Spectator* (No. 249), remarks, in confirmation of this theory, that the *vainest* part of mankind are most addicted to the passion of laughter. Now, how can this be, if the *proudest* part of mankind are also most addicted to it, unless we suppose vanity and pride to be the same thing? But they certainly are different passions. The proud man despises other men, and derives his chief pleasure from the contemplation of his own importance; the vain man stands in need of the applause of others, and cannot be happy without it. Pride is apt to be reserved and sullen; vanity is often affable, and officiously obliging. The proud man is so confident of his merit, and thinks it so obvious to all the world, that he will scarcely give himself the trouble to inform you of it; the vain man, to raise your admiration, scruples not to tell you, not only the whole truth, but even a great deal more. In the same person, these two passions may, no doubt, be united; but some men are too proud to be vain, and some vain men are too conscious of their own weakness to be proud. Be all this, however, as it will, we have not as yet made any discovery of the cause of laughter; in regard to which, I apprehend, that the vain are not more intemperate than other people; and I am sure that the proud are much less so.

"Hutcheson's account of the origin of laughter is equally unsatisfactory. Granting what he says to be true, I would observe, in the first place, what the ingenious author seems to have been aware of, that there may be a mixture of meanness and dignity where there is nothing ludicrous. A city, considered as a collection of low and lofty houses, is no laughable object. Nor was that person either ludicrous or ridiculous, whom Pope so justly characterizes,

> The greatest, wisest, meanest of mankind.

But, secondly, cases might be mentioned, of laughter arising from a group of ideas or objects, wherein there is no discernible opposition of meanness or dignity. We are told of the dagger of Hudibras, that

> It could scrape trenchers, or chip bread,
> Toast cheese or bacon, though it were
> To bait a mouse trap, 'twou'd not care;
> 'Twou'd make clean shoes, or in the earth
> Set leeks and onions, and so forth.

The humour of the passage cannot arise from the meanness of these offices compared with the dignity of the dagger, nor from any opposition of meanness and dignity in the offices themselves, they being all equally mean; and must therefore be owing to some peculiarity in the description. We laugh when a droll mimics the solemnity of a grave person; here dignity and meanness are indeed united; but we laugh also (though not so heartily perhaps) when he mimics the peculiarities of a fellow as insignificant as himself, and displays no opposition of dignity and meanness. The levities of Sancho Pança, opposed to the solemnity of his master, and compared with his own schemes of preferment, form an entertaining contrast; but some of the vagaries of that renowned squire are truly laughable, even when his preferment and his master are out of the question. Men laugh at puns; the wisest and wittiest of our species have laughed at them; Queen Elizabeth, Cicero, and Shakspeare, laughed at them; clowns and children laugh at them; and most men, at one time or other, are inclined to do the same; but in this sort of low wit, is it an opposition of meanness and dignity that entertains us? Is it not rather a mixture of sameness and diversity; sameness in the sound, and diversity in the signification?

"In the characters mentioned by Akenside, the author does not distinguish between what is *laughable* and what is *contemptible;* so that we have no reason to think that he meant to specify the qualities peculiar to those things which provoke *pure laughter;* and whatever account we may make of his definition, which to those who acquiesce in the foregoing reasonings may appear not quite satisfactory, there is in the poem a passage that deserves particular notice, as it seems to contain a more exact account of the ludicrous quality than is to be found in any of the theories above mentioned. This passage we shall soon have occasion to quote."

Dr Beattie then proceeds to give his own theory concerning the origin of laughter, which he supposes to arise from the view of things incongruous united in the same assemblage. "However imperfect," says he, "the above-mentioned theories may appear, there is none of them destitute of merit; and indeed the most fanciful philosopher seldom frames a theory without consulting nature in some of her more obvious appearances. Laughter very frequently arises from the view of dignity and meanness united in the same object; sometimes, no doubt, from the appearance of assumed inferiority, as well as of small faults and unimportant turpitudes; and sometimes, perhaps, though rarely, from that sort of pride which is described in the passage already quoted from Hobbes.

"All these accounts agree in this, that the cause of laughter is something compounded; or something that disposes the mind to form a comparison, by passing from one object or idea to another. That this is in fact the case, cannot be proved *a priori;* but this holds in all the examples hitherto given, and will be found to hold in all that are given hereafter. May it not then be laid down as a principle, that laughter arises from the view of two or more objects or ideas disposing the mind to form a comparison? According to the theory of Hobbes, this comparison would be between the ludicrous object and ourselves; according to those writers who misapply Aristotle's definition, it would seem to be formed between the ludicrous object and things or persons in general; and if we incline to Hutcheson's theory, which is the best of the three, we shall think that there is a comparison of the parts of the ludicrous object, first with one another, and secondly with ideas or things extraneous.

"Further, every appearance that is made up of parts, or that leads the mind of the beholder to form a comparison, is not ludicrous. The body of a man or woman, of a horse, a fish, or a bird, is not ludicrous, though it consists of many parts; and it may be compared to many other things without raising laughter; but the picture described in the beginning of the epistle to the Pisoes, with a man's head, a horse's neck, feathers of different birds, limbs of different beasts, and the tail of a fish, would have been thought ludicrous 1800 years ago, if we believe Horace, and in certain circumstances would no doubt be so at this day. It would seem, then, that 'the parts of a laughable assemblage must be in some degree unsuitable and heterogeneous.'

"Moreover, any one of the parts of the Horatian monster, a human head, a horse's neck, the tail of a fish, or the plumage of a fowl, is not ludicrous in itself; nor would those several pieces be ludicrous if attended to in succession, without any view to their union. For, to see them disposed on the different shelves of a museum, or even on the same shelf, nobody would laugh, except, perhaps, the thought of uniting them were to occur to his fancy, or the passage of Horace to his memory. It seems to follow, that 'the incongruous parts of a laughable idea or object must either be combined so as to form an assemblage, or must be supposed to be so combined.'

"May we not then conclude, 'that laughter arises from the view of two or more inconsistent, unsuitable, or incongruous parts or circumstances, considered as united in one complex object or assemblage, or as acquiring a sort of mutual relation, from the peculiar manner in which the mind takes notice of them?' The lines from Akenside formerly referred to, seem to point at the same doctrine:

> Where'er the pow'r of ridicule displays
> Her quaint-ey'd visage, *some incongruous form,*
> *Some stubborn dissonance of things combin'd,*
> Strikes on the quick observer.

And to the same purpose, the learned and ingenious Dr Gerard, in his *Essay on Taste*: 'The sense of ridicule is gratified by an inconsistence and dissonance of circumstances in the same object, or in objects nearly related in the main; or by a similitude or a relation unexpected between things on the whole opposite and unlike.'

"And therefore, instead of saying with Hutcheson, that the cause or object of laughter is an 'opposition to dignity and meanness,' I would say, in more general terms, that it is 'an opposition to suitableness or unsuitableness, or of relation and the want of relation, united, or supposed to be united, in the same assemblage.' Thus the offices ascribed to the dagger of Hudibras seem quite heterogeneous; but we discover a bond of connection among them, when we are told that the same weapon could occasionally perform them all. Thus, even in that mimicry which displays no opposition of dignity and meanness, we perceive the actions of one man joined to the features and body of another; that is, a mixture of unsuitableness, or want of relation, arising from the difference of persons, with congruity and similitude, arising from the sameness of the actions. And here let it be observed in general, that the greater number of incongruities that are blended in the same assemblage, the more ludicrous it will probably be. If, as in Butler's resemblance of the morning to a boiled lobster, there is a mixture of dignity and meanness, as well as of likeness and dissimilitude, the effect of the contrast will be more powerful than if only one of these oppositions had occurred in the ludicrous idea. The sublimity of Don Quixote's mind, contrasted and connected with his miserable equipage, forms a very comical exhibition; but when all this is still further connected and contrasted with Sancho Pança, the ridicule is heightened exceedingly. Had the knight of the lions been better mounted and accoutred, he would not have made us smile so often; because, the hero's mind and circumstances being more adequately matched, the whole group would have united fewer inconsistencies, and reconciled fewer incongruities. Butler has combined a still greater variety of uncouth and jarring circumstances in Ralpho and Hudibras; but the picture, though more elaborate, is less natural. Yet this argues no defect of judgment. His design was, to make his hero not only ludicrous, but contemptible; and therefore he jumbles together, in his equipage and person, a number of mean and disgusting qualities, pedantry, ignorance, nastiness, and extreme deformity. But the knight of La Mancha, though a ludicrous, was never intended for a contemptible personage. He often moves our pity, he never forfeits our esteem; and his adventures and sentiments are generally interesting; which could not have been the case if his story had not been natural, and himself been endowed with great as well as good qualities. To have given him such a shape, and such weapons, arguments, boots, and breeches, as Butler has bestowed on his champion, would have destroyed that solemnity which is so striking a feature in Don Quixote; and Hudibras, with the manners and person of the Spanish hero, would not have been that paltry figure which the English poet meant to hold up to the laughter and contempt of his countrymen. Sir Launcelot Greaves is of Don Quixote's kindred, but a different character. Smollett's design was not to expose him to ridicule, but rather to recommend him to our pity and admiration. He has therefore given him youth, strength, and beauty, as well as courage and dignity of mind; has mounted him on a generous steed, and arrayed him in an elegant suit of armour. Yet, that the history might have a comic air, he has been careful to contrast and connect Sir Launcelot with a squire and other associates of very dissimilar tempers and circumstances.

"What has been said of the cause of laughter does not amount to an exact description, far less to a logical definition; there being innumerable combinations of congruity and inconsistency, of relation and contrariety, of likeness and dissimilitude, which are not ludicrous at all. If we could ascertain the peculiarities of these, we should be able to characterize with more accuracy the general nature of ludicrous combination. But before we proceed to this, it would be proper to evince, that of the present theory thus much at least is true, that though every incongruous combination is not ludicrous, every ludicrous combination is incongruous.

"It is only by a detail of facts or examples that any theory of this sort can be either established or overthrown. By such a detail, the foregoing theories have been, or may be, shown to be ill founded, or not sufficiently comprehensive. A single instance of a laughable object, which neither unites, nor is supposed to unite, incongruous ideas, would likewise show the insufficiency of the present; nor will I undertake to prove (for indeed I cannot), that no such instance can be given. A complete enumeration of ludicrous objects it would be in vain to attempt; and therefore we can never hope to ascertain, beyond the possibility of doubt, that common quality which belongs to all ludicrous ideas that are, or have been, or may be, imagined. All that can be done in a case of this kind is to prove, by a variety of examples, that the theory now proposed is more comprehensive, and better founded, than any of the foregoing." This our author afterwards shows at full length; but as the variety of examples adduced by him would take up too much room to be inserted here, and as every reader must be capable of adducing numberless instances of ludicrous cases to himself, we shall content ourselves with the above explanation of the different theories of laughter, referring those who desire further satisfaction to the treatise already quoted.

LAUINGEN, a city of Bavaria, in the circle of the Upper Danube, the capital of a bailiwick of the same name. It is walled, and has 733 houses, with 3530 inhabitants, who make linen and woollen cloths, and have much trade by the Danube, on which it is situated.

LAUNCESTON, a borough town of the hundred of East, in the county of Cornwall, 213 miles from London. It is pleasantly situated on a gentle elevation overlooking the river Tamer. It has good markets, which are held on Wednesday and Saturday. It is one of the county towns, in which the assizes are held in the spring, as they are at Bodmin in the summer. The corporation consists of a mayor, a recorder, and twelve aldermen. The population amounted in 1801 to 1483, in 1811 to 1758, in 1821 to 2183, and in 1831 to 2231. It formerly returned two members to the House of Commons, but by the reform act elects now only one.

LAUNCH, in the sea language, signifies to put out; as, *launch the ship*, that is, put her out of dock; *launch aft*, or *forward*, speaking of things that are stowed in the hold, is, put them more forward. *Launch, ho!* is a term used when a yard is hoisted high enough, and signifies *hoist no more*. See also LANCH.

LAUNDER, in *Mineralogy*, a name given in Devonshire, and other places, to a long and shallow trough, which receives the powdered ore after it comes out of the box or coffer, a sort of mortar, in which it is powdered with iron pestles. The powdered ore, which is washed into the launder by the water from the coffer, is always finest nearest the grate, and coarser all the way down.

LAUPEN, a town of the canton of Berne, in Switzerland, the capital of a bailiwick of the same name, situated at the junction of the rivers Sense and Laane. It is celebrated for the victory gained by the confederated states in 1339, and contains 1230 inhabitants.

LAURA, in *Ecclesiastical History*, a name given to a collection of little cells at some distance from one another, in which the hermits in ancient times lived together in a wilderness or desert place.

These hermits did not live in community, but each monk provided for himself in his own distinct cell. The most celebrated lauras mentioned in ecclesiastical history were in Palestine; as the laura of St Euthymus, four or five leagues distant from Jerusalem; the laura of St Saba, near the brook Kedron; and the laura of the Towers, near the river Jordan.

POET-LAUREATE, an officer of the household of the kings of Britain, whose business consists only in composing an ode annually on his majesty's birth-day, and the new year; and sometimes also, though rarely, on occasion of any remarkable victory. Of the first institution of poets-laureate, Mr Wharton has given an account in his History of English Poetry. "Great confusion," says he, "has entered into this subject, on account of the degrees in grammar, which included rhetoric and versification, anciently taken in our universities, particularly at Oxford, on which occasion a wreath of laurel was presented to the new graduate, who was afterwards usually styled *Poeta Laureatus*. These scholastic laureations, however, seem to have given rise to the appellation in question. I will give some instances at Oxford, which at the same time will explain the nature of the studies for which our academical philologists received their rewards. About the year 1470, one John Watson, a student in grammar, obtained a concession to be graduated and laureated in that science, on condition that he composed one hundred Latin verses in praise of the university, and a Latin comedy. Another grammarian was distinguished with the same badge, after having stipulated that at the next public act he would affix the same number of hexameters on the great gates of St Mary's Church, that they might be seen by the whole university. This was at that period the most convenient mode of publication. About the same time one Maurice Byrchensaw, a scholar in rhetoric, supplicated to be admitted to read lectures, that is, to take a degree in that faculty; and his petition was granted, with a provision that he should write one hundred verses on the glory of the university, and not suffer Ovid's Art of Love, and the Elegies of Pamphilius, to be studied in auditory. Not long afterwards, one John Bulman, another rhetorician, having complied with the terms imposed, of explaining the first book of Tully's Offices, and likewise the first of his Epistles, without any pecuniary emolument, was graduated in rhetoric, and a crown of laurel was publicly placed on his head by the hands of the chancellor of the university. About the year 1489 Skelton was laureated at Oxford, and in the year 1493 was permitted to wear his laurel at Cambridge. Robert Whittington affords the last instance of a rhetorical degree at Oxford. He was a secular priest, and eminent for his various treatises on grammar, and for his facility in Latin poetry. Having exercised his art many years, and submitting to the customary demand of a hundred verses, he was honoured with the laurel in the year 1512.

"With regard to the poet-laureate of the kings of England, he is undoubtedly the same that is styled the *king's versifier*, and to whom 100 shillings were paid as his annual stipend in the year 1251. But when or how that title commenced, and whether this officer was ever solemnly crowned with laurel at his first investiture, I will not pretend to determine, after the searches of the learned Selden on this question have proved unsuccessful. It seems most probable that the barbarous and inglorious name of *versifier* gradually gave way to an appellation of more elegance and dignity; or rather, that at length those only were in general invited to this appointment who had received academical sanction, and had merited a crown of laurel in the universities for their abilities in Latin composition, particularly Latin versification. Thus the *king's laureate* was nothing more than a *graduated* rhetorician employed in the service of the king. That he originally wrote in Latin, appears from the ancient title *versificator;* and may be moreover collected from the two Latin poems which Baston and Gulielmus, who appear to have respectively acted in the capacity of royal poets to Richard I. and Edward II. officially composed on Richard's crusade, and Edward's siege of Striveling Castle.

"Andrew Bernard, successively poet-laureate of Henry VII. and VIII. affords a still stronger proof that this officer was a Latin scholar. He was a native of Thoulouse, and an Augustine monk. He was not only the king's poet-laureate, as it is supposed, but his historiographer, and preceptor in grammar to Prince Arthur. He obtained many ecclesiastical preferments in England. All the pieces now to be found which he wrote in the character of poet-laureate are in Latin. These are, An Address to Henry VIII. for the most auspicious beginning of the tenth year of his reign, with an *Epithalamium* on the marriage of Francis the dauphin of France with the king's daughter; A New Year's Gift for the year 1515; and Verses wishing prosperity to his majesty's thirteenth year. He has left some Latin hymns; and many of his Latin prose pieces, which he wrote in the quality of historiographer to both monarchs, are remaining.

"I am of opinion that it was not customary for the royal laureate to write in English, till the reformation of religion had begun to diminish the veneration for the Latin language; or, rather, till the love of novelty, and a better sense of things, had banished the narrow pedantries of monastic erudition, and taught us to cultivate our native tongue."

LAURENTALIA, or LARENTALIA, called also *Laurentinalia*, *Laurentales*, and *Larentales*, feasts celebrated amongst the Romans on the tenth of the kalends of January, or twenty-third of December, in memory of Acca Laurentia, wife of the shepherd Faustulus, and nurse of Romulus and Remus. Acca Laurentia, from whom the solemnity took its name, is represented as no less remarkable for the beauty of her person than her lasciviousness, on account of which she was nick-named by her neighbours *lupa*, or she-wolf, which is said to have given rise to the tradition of Romulus and Remus being suckled by a she-wolf. She afterwards married a very rich man, who brought her great wealth, which, at her death, she left to the Roman people; in consideration of which they performed these rites in honour of her, though others represent the feast as held in honour of Jupiter Latiaris.

LAURENTIUS, one of the first printers, and, according to some, the inventor of the art, was born at Haerlem, about the year 1370, and filled several offices in the magistracy of that city. Those writers are mistaken who assign to him the surname of *Coster*, or assert that the office of *ædituus* was hereditary in his family. In a diploma of Albert of Bavaria in 1380, in which, amongst other citizens of Haerlem, Laurentius's *father* is mentioned by the name of *Joannes Laurentii filius*, Beroldus, who was surely of another family, is called *ædituus*; and in 1396 and 1398 Henricus a Lunen enjoyed that office, after whose resignation, Count Albert having conferred on the citizens the privilege of electing their *ædituus*, they soon afterwards fixed on Laurentius, who was subsequently called *Coster* from his office, and not from his family name, as he was descended from an illegitimate branch of the Gens Brederodia. His office was very lucrative; and that he was a man of great property is testified by the elegance of his residence. That he was the inventor of printing, is asserted in the narrative of Junius. His first work was an *Horarium*, containing the Letters of the Alphabet, the Lord's Prayer, the Apostles' Creed, and two or three short Prayers; the next was the *Speculum Salutis*, in which he introduced pictures on wooden blocks; then he printed *Donatus*, in the larger size; and afterwards the same work in a less size. All these were printed on separate moveable wooden types, fastened together by threads. If it be thought improbable, that so ingenious a man should have proceeded no farther than the invention of wooden types, it may be answered, that he printed for profit, not for fame; and wooden types were not only at that time made sooner and cheaper than metal could be, but were sufficiently durable for the small impressions of each book he must necessarily have printed. His press was nearly shaped like the common wine-presses. He printed some copies of all his books both on paper and vellum. It has been commonly supposed, though without reason, that he quitted the profession, and died broken hearted; but it is certain, that he did not live to see the art brought to perfection. He died in 1440, aged seventy; and was succeeded either by his son-in-law, Thomas Peter, who married his only daughter Lucia; or by their immediate descendants, Peter, Andrew, and Thomas, who were old enough to conduct the business, the eldest being at least twenty-two or twenty-three years of age. What books they printed it is not easy to determine, since, after the example of Laurentius, they added to their books, neither their names, nor the place where they were printed, nor the date of the year. Their first essays were new editions of *Donatus* and the *Speculum*. They afterwards reprinted the latter, with a Latin translation, in which they used their grandfather's wooden pictures, and printed the book partly on wooden blocks, partly on wooden separate types, according to Mr Meerman, who has given an exact engraving of each sort, taken from different parts of the same book, which was published between the years 1442 and 1450. Nor did they stop here. They continued to print several editions of the *Speculum*, both in Latin and in Dutch; and many other works, particularly *Historia Alexandri Magni; Flavii Vedatii* [for *Vegetii*] *Renati Epitome de Re Militari*; and *Opera varia a Thomas Kempis*. Of these Mr Meerman has given an engraved specimen. They were all printed with separate wooden types, and, by their great neatness, are a proof that the descendants of Laurentius were industrious in improving his invention. Kempis was printed at Haerlem in 1472, and was the last known work of Laurentius's descendants, who soon afterwards disposed of all their materials, and probably quitted the employment; the use of fusil types having about that time been universally diffused throughout Holland by the settling of Martens at Alost, where he pursued the art with reputation for upwards of sixty years. See PRINTING.

LAURENTIUM, or LAURENS CASTRA, in *Ancient Geography*, a town of Latium, supposed to have been the royal residence of those most ancient kings Latinus, Picus, and Faunus. Hither the Emperor Commodus retired during a pestilence. Its name was derived from an adjoining grove of bay trees, midway between Ostia and Antium, and it is supposed to have stood in the place now called *San Lorenzo*, which seems to be confirmed from the Via Laurentina leading to Rome.

LAURO, PHILIPPO, a celebrated painter, was born at Rome in 1623. He learned the first rudiments of the art from his father Balthasar, who was himself a good painter; but he afterwards studied under Angelo Carosello, his brother-in-law, and proved so great a proficient, that in a short time he far surpassed his tutors in design, colouring, and elegance of taste. He applied himself to painting historical subjects in a small size, enriching the backgrounds with lively landscapes, that afforded the eye and the judgment equal gratification; but though his small paintings are most approved, he finished several grand compositions for altar-pieces which were highly esteemed. He died in 1694; and his works are eagerly bought up at high prices all over Europe.

LAUSANNE, a city, the capital of the canton of Vaud, in Switzerland, in the circle of the same name. It is built on five hills, near the lake of Geneva. The situation is fine, though it is an irregularly built place. There is a fine Gothic cathedral, a council-house, a hospital, and some other public buildings, with 1060 dwelling-houses, and 10,200 inhabitants. The situation is healthy, though cold in winter, from its elevation being 1570 feet above the level of the sea. There is a college with fourteen professors, and a good library. A few manufactures are carried on, chiefly for articles of luxury or ornament. Some good wine is grown near the city. Long. 6. 40. 10. E. Lat. 46. 31. 5. N.

LAUSATIA, one of the circles into which the present kingdom of Saxony is divided. It touches on the south the Austrian kingdom of Bohemia, and on the north and the east the Prussian provinces of Brandenburg and of Silesia. It is extended over 1650 square miles, comprehends sixteen cities and towns, 458 villages, and 336,500 inhabitants, of whom one fifth are of the ancient race of Wenden or Vandals, and still retain their primitive language and manners. The northern portion of the circle is mountainous, but the southern division is more level, and is fertile and well cultivated. The chief city is Bautzen.

LAUTERBACH, a town of Hesse-Darmstadt, in the canton of Upper Hesse. It is the capital of the bailiwick of its name, is situated on the river Altfell, is walled, and contains 538 houses, with 3050 inhabitants, who are employed in linen and woollen manufactures, and in tanneries.

LAVA, a stream of melted minerals, which runs out of the mouths, or bursts out through the sides, of burning mountains, during the time of an eruption. See ÆTNA and VESUVIUS, also VOLCANO.

LAVAL, an arrondissement of the department of the Mayenne, in France, extending over 715 square miles. It is divided into nine cantons and ninety-three communes, and contains a population of 108,600 persons. The chief place is the city of the same name, which is also the capital of the department. It is finely situated on both sides of the Mayenne, but is ill built, with narrow and crooked streets and antique houses, and only agreeable from the walks that surround it. It contains 3520 houses, with 15,500 inhabitants, who are chiefly employed in making linens, which, under the name *toiles de Laval*, have great celebrity throughout the kingdom. There are also some serges and thin stuffs of worsted made. Long. 0. 52. W. Lat. 48. 4. N.

LAVATER, JOHN GASPARD CHRISTIAN, best known by his writings on physiognomy, was born at Zurich, in Switzerland, in 1741. He was brought up a protestant minister, and entered into holy orders in 1761. He was for some time pastor of the orphans' church in that city; but from the year 1778 he was deacon and pastor of St Peter's church in the same place. The eloquence of his discourses in the pulpit, as well as the ardent zeal and Christian benevolence with which he discharged the duties of his office, procured for him an early reputation. Though not much conversant with books, he had a very extensive knowledge of human nature, and a most acute discernment. His theological writings in prose and verse are little known, but his works on physiognomy have extended his fame throughout every part of Europe. We are informed by himself, that he felt an early propensity to study the human face, and frequently drew such features as made a peculiar impression upon his mind; but his choice of physiognomy was fixed by the suggestion of Dr Zimmerman, who, having heard his remarks on the singular countenance of a soldier whom they saw passing by as they stood together at a window, urged him to pursue and methodise his ideas. He soon acquired a full conviction of the reality of physiognomical science, and of his own discoveries in it. His first volume on this subject appeared at Leipzig in 1776, and the twenty sections of which it was composed he modestly denominated fragments. With him it appeared to be an axiom, that the powers and faculties of the mind have representative signs in the solid parts of the countenance. This notion he extended to all animated nature, firmly believing that internal qualities invariably denote themselves by external marks or tokens.

Two more volumes soon appeared in succession, containing a wonderful assemblage of curious observations, refined reasoning, delicate feeling, and philanthropic sentiments, with a number of engravings highly finished and singularly expressive. This work was well translated into the French and English languages, and for some time formed the favourite topic of literary discussion. So much was its author admired, that no foreigner of distinction passed through Zurich without obtaining an interview with Lavater, and asking his opinion of some character from a shade or miniature. His huge volumes, however, are now seldom looked at except for the sake of the plates, and his physiognomical notions appear to be consigned to oblivion with other sciences of a chimerical nature. One of the best known of his miscellaneous publications is his Aphorisms on Man, which contain originality both in sentiment and expression, with deep and philosophical views of human nature.

Lavater was zealously attached to the Christian revelation, and translated Bonnet's Inquiry into the Evidences of Christianity, into the German language. This book he dedicated to the celebrated Jewish philosopher Moses Mendelsohn, with a challenge either to refute it publicly, or profess his conviction of the truth of its arguments. This challenge he afterwards confessed to have been inconsiderate, and allowed that his zeal had misled him. His popularity at Zurich was so extremely great, that in his walks it was no uncommon thing to see the people flocking around him, and kissing his hand in token of respect. He had a most exemplary moral character, and his zeal in doing good was scarcely ever surpassed. He was mild and moderate in conversation, although naturally full of fire and sensibility; he was candid in his estimate of such as differed from him in opinion; he always rose early, and never took his breakfast till he thought he had earned it. He was the determined enemy of tyranny in every shape, being possessed of the genuine Swiss zeal for liberty. He was therefore a friend to the French revolution at its commencement; but the rapine, plunder, and bloodshed which afterwards disgraced it, made him one of its bitterest adversaries. On the day when the unfortunate city of Zurich was stormed by Massena in 1799, he received a wound in the breast from a Swiss soldier in the streets, to whom he had formerly been a benefactor. He never wholly recovered from the effects of this wound; and he brought on a train of dangerous symptoms by attending for more than an hour, in the open air, a man who was condemned to be shot as a spy. The activity and vigour of his mind, however, continued till a short time before his death, which took place on the 2d of January 1801.

LAVATORY, or LAVADERO, a name given to certain places in Chili and Peru, where gold is obtained from earth by washing.

LAVAUR, an arrondissement of the department of the Tarn, in France, 316 square miles in extent. It consists of five cantons, divided into sixty-one communes, and contains 47,800 inhabitants. The capital is the city of the same name, situated on the left bank of the river Agout. It contains 850 houses, and 6600 inhabitants employed in making silk goods. Long. 1. 47. E. Lat. 43. 42. N.

LAVENHAM, a town of the hundred of Baberg, in the county of Suffolk, sixty-two miles from London. It is governed by a corporation of six capital burgesses, chosen for life. It had once a cloth manufactory, which has disappeared, and now only carries on some trade in hempen goods. The population amounted in 1801 to 1776, in 1811 to 1711, in 1821 to 1898, and in 1831 to 2107.

LAVER, in scripture history, a sacred utensil placed in the court of the Jewish tabernacle, consisting of a bason, whence water was drawn by cocks, for washing the hands and feet of the officiating priests, and also the entrails and legs of the victims.

LAVERNA, in *Antiquity*, the goddess of thieves and cheats amongst the Romans, who honoured her with public worship, because she was supposed to favour those who wished that their designs might not be discovered. Varro says that she had an altar near one of the gates of Rome, which was hence called *porta lavernalis*.

LAVINIUM, in *Ancient Geography*, a town of Latium, six miles to the east of Laurentum, according to an ancient map; so named from *Lavinia*, consort of Æneas, and daughter of King Latinus, and built by the Trojans.

LAVOISIER, ANTOINE LAURENT, the celebrated discoverer of the new chemical theory, was born at Paris in the month of August 1745. His father being a man of opulence acquired in commerce, spared no cost on the education of his son. The latter studied at Mazarin College, and obtained a great number of prizes in his classes; but he soon evinced a decided taste for the sciences, which his father had the good sense to encourage. On leaving college, he applied himself to the study of mathematics and astronomy in the observatory of Lacaille, to that of chemistry in the laboratory of Rouelle, and to that of botany under Bernard de Jussieu, whom he attended in his herborisations. His passion for study was such, that he put himself on a milk diet, and denied himself the pleasures of general society, living only with his masters and fellow-students, all of whom remained his friends throughout life. An extraordinary premium having been offered by the French government in the year 1764, for the best and most economical method of lighting the streets of an extensive city, Lavoisier, although at that time only twenty-one years of age, gained the gold medal; and his excellent memoir was published by the academy, of which he became a member on the 13th of May 1768. His attention was successively occupied with the pretended conversion of water into earth, the analysis of the gypsum found in the vicinity of Paris, the congelation of water, the phenomena of thunder, and the aurora borealis.

By undertaking journeys with Guettard into every province of France, he was enabled to procure an immense variety of materials for a description of the mineral kingdom, and serving also as the foundation of a great work on the revolutions of the globe, two admirable sketches of which are to be seen in the Memoirs of the French Academy for 1772 and 1787. His whole time and fortune were dedicated to the cultivation of the sciences, nor did he seem more attached to one than to another, till an interesting event decided his choice in favour of chemistry. The discovery of gases, just made known to the learned world by Black, Priestley, Scheele, Cavendish, and Macbride, appeared to him like a new creation.

Lavoisier was so struck with the grandeur and importance of the discovery, that he turned all his attention to this fountain of truths, perceiving the powerful influence which this new science would exert over all physical researches. He was inspired with the true spirit of inductive philosophy, and all his experiments had a direct reference to general views. In the year 1773, he presented to the academy, and published, his *Opuscules Physiques et Chimiques*, containing a history of whatever had been done before respecting the gases, and concluding with his own grand and interesting experiments. He demonstrated that metals, in calcination, derive their increased weight from the absorption of highly-respirable air, of which he afterwards proved that nitrous acid is composed. His chemical ingenuity was now so well known, that Turgot employed him in 1776 to inspect the manufacture of gunpowder, which he greatly improved in strength, or explosive force. In the year 1778 he discovered that all acids contain the respirable portion of the atmosphere as a constituent principle, and to this he gave the name of oxygen. This was the first grand step towards the new chemistry, which was fully completed by his confirming the discovery of the composition of water, ascertained in 1783.

His Elements of Chemistry, in two vols. 8vo, were published in 1789, and form a beautiful model of scientific composition, being at once clear, logical, and elegant. In a very few years his system was almost universally adopted, so complete was the conviction it carried along with it to every candid and reflecting mind. The last of Lavoisier's philosophical works was on the respiration and transpiration of animals, first read to the academy on the 4th of May 1791. By a number of the nicest experiments, he found that a man in one day perspires forty-five ounces; that he consumes thirty-three ounces of vital air or oxygen; that eight cubic feet of carbonic acid gas are discharged from his lungs; that the weight of water discharged from the lungs is twenty-three ounces, composed of three of hydrogen and twenty of oxygen; which interesting discoveries he directed to the improvement of medicine.

There are no fewer than forty memoirs of Lavoisier in the volumes of the Academy of Sciences from 1772 to 1793, all relating to the grand phenomena of the science; such as the analysis of atmospherical air, the formation of elastic fluids, the properties of the matter of heat, the composition of acids, the decomposition of water, &c. To the sciences, arts, and manufactures, he rendered the most essential services, both in a public and in a private capacity. He succeeded Buffon and Tillet as treasurer to the academy, into the accounts of which he introduced both economy and order. He was consulted by the National Convention as to the most eligible means of improving the manufacture of assignats, and of augmenting the difficulties of forging them. He turned his attention also to political economy, and, between the years 1778 and 1785, he allotted 240 *arpents* in the Vendomois for experimental agriculture, and increased the ordinary produce by one half. In 1791, the Constituent Assembly invited him to draw up a plan for rendering more simple the collection of the taxes; which produced an excellent report, printed under the title of Territorial Riches of France.

Whilst the horrors of Robespierre's usurpation continued, he used to observe to Lalande that he foresaw he would be deprived of all his property, but that he was extremely willing to work for his subsistence; and it is supposed that he meant to pursue the profession of apothecary, as most congenial to his studies. But the unrelenting tyrant had already fixed his doom. He was thrown into prison, whence he was soon dragged to the scaffold, where he perished, with twenty-eight farmers-general, on the 8th of May 1794, for no other crime but because he was opulent, and belonged to that body. A report, drawn up by M. Hallé, a courageous citizen, containing a description of the works, and a recapitulation of the discoveries, of Lavoisier, sufficient to make an impression upon the most obdurate heart, was presented to the revolutionary tribunal. Even Lavoisier himself deigned to ask of the miscreants who had condemned him, a delay for a few days, that he might have time to complete some experiments interesting to humanity; alluding probably to his researches on transpiration, which had been suspended by his imprisonment. But all was in vain. The president of that horrible tribunal told him, in a ferocious tone, that they had no longer any need of learned men; and his head fell under the axe of the guillotine, in the fifty-first year of his age.

Lavoisier was tall, and possessed a countenance full of benignant expression. His character was mild, humane, social, obliging; and he discovered an incredible degree of activity. He had great influence, on account of his credit, fortune, reputation, and his office in the treasury; but all the use he made of it was to do good; yet this did not prevent jealousy on the part of others. In 1771 he married Marie-Anne-Pierette-Paulze, the daughter of a farmer-general, whose excellent accomplishments formed the delight of his life, who assisted him in his labours, and even drew the figures for his last work. This lady had the misfortune to behold her father, her husband, and her most intimate friends, assassinated in one day; and she was herself imprisoned, nay, even menaced with a similar fate; but the unshaken fortitude of her mind enabled her to rise superior to the horrors of her condition. Lavoisier died childless.

Definition.

LAW (says Blackstone, from whose work the following observations are abridged), in its most general and comprehensive sense, signifies a rule of action; and is applied indiscriminately to all kinds of action, whether animate or inanimate, rational or irrational. Thus we say, the laws of motion, of gravitation, of optics, of mechanics, as well as the laws of nature and of nations. And it is that rule of action which is prescribed by some superior, and which the inferior is bound to obey.

Thus, when the Supreme Being formed the universe, and created matter out of nothing, he impressed certain principles upon that matter, from which it can never depart, and without which it would cease to be. When he put that matter into motion, he established certain laws of motion, to which all moveable bodies must conform. And, to descend from the greatest operations to the smallest, when a workman forms a clock or other piece of mechanism, he establishes at his own pleasure certain arbitrary laws for its direction, as, that the hand shall describe a given space in a given time; to which law as long as the work conforms, so long it continues in perfection, and answers the end of its formation.

If we advance farther, from mere inactive matter to vegetable and animal life, we shall find them still governed by laws, more numerous indeed, but equally fixed and invariable. The whole progress of plants, from the seed to the root, and from thence to the seed again; the method of animal nutrition, digestion, secretion, and all other branches of vital economy; are not left to chance, or the will of the creature itself, but are performed in a wondrous involuntary manner, and guided by unerring rules laid down by the great Creator.

This, then, is the general signification of law, a rule of action dictated by some superior being. And, in those creatures that have neither the power to think nor to will, such laws must be invariably obeyed, so long as the creature itself subsists; for its existence depends on that obedience. But laws, in their more confined sense, and in which it is our present business to consider them, denote the rules, not of action in general, but of *human* action or conduct; that is, the precepts by which man, the noblest of all sublunary beings, a creature endowed with both reason and free will, is commanded to make use of those faculties in the general regulation of his behaviour.

Man, considered as a creature, must necessarily be subject to the laws of his Creator, for he is entirely a dependent being. A being independent of any other has no rule to pursue but such as he prescribes to himself; but a state of dependence will inevitably oblige the inferior to take the will of him on whom he depends as the rule of his conduct, not indeed in every particular, but in all those points wherein his dependence consists. This principle, therefore, has more or less extent and effect, in proportion as the superiority of the one and the dependence of the other is greater or less absolute or limited. And consequently, as man depends absolutely upon his Maker for every thing, it is necessary that he should in all points conform to his Maker's will.

This will of his Maker is called the *law of nature.* For as God, when he created matter, and endued it with a principle of mobility, established certain rules for the perpetual direction of that motion; so, when he created man, and endued him with free will to conduct himself in all parts of life, he laid down certain immutable laws of human nature, whereby that free will is in some degree regulated and restrained, and gave him also the faculty of reason to discover the purport of those laws.

Considering the Creator only as a being of infinite power, he was able unquestionably to have prescribed whatever laws he pleased to his creature man, however unjust or severe. But as he is also a Being of infinite wisdom, he has laid down only such laws as were founded in those relations of justice that existed in the nature of things antecedent to any positive precept. These are the eternal immutable laws of good and evil, to which the Creator himself in all his dispensations conforms, and which he has enabled human reason to discover, so far as they are necessary for the conduct of human actions. Such, among others, is the principle, that we should live honestly, hurt nobody, and render to every one his due; to which three general precepts Justinian has reduced the whole doctrine of law.

But if the discovery of these first principles of the law of nature depended only upon the due exertion of right reason, and could not otherwise be obtained than by a chain of metaphysical disquisitions, mankind would have wanted some inducement to have quickened their inquiries, and the greater part of the world would have rested content in mental indolence, and ignorance, its inseparable companion. As therefore the Creator is a being not only of infinite power and wisdom, but also of infinite goodness, he has been pleased so to contrive the constitution and frame of humanity, that we should want no other prompter to inquire after and pursue the rule of right, but only our own self-love, that universal principle of action. For he has so intimately connected, so inseparably interwoven, the laws of eternal justice with the happiness of each individual, that the latter cannot be attained but by observing the former; and if the former be punctually obeyed, it cannot but induce the latter. In consequence of which mutual connection of justice and human felicity, he has not perplexed the law of nature with a multitude of abstracted rules and precepts, referring merely to the fitness or unfitness of things, as some have vainly surmised; but has graciously reduced the rule of obedience to this one paternal precept, " that man should pursue his own happiness." This is the foundation of what we call *ethics*, or *natural law;* for the several articles into which it is branched in our systems amount to no more than demonstrating that this or that action tends to man's real happiness, and therefore very justly concluding, that the performance of it is a part of the law of nature; or, on the other hand, that this or that action is destructive of man's real happiness, and therefore that the law of nature forbids it.

This law of nature, being coeval with mankind, and dictated by God himself, is of course superior in obligation to any other. It is binding over all the globe, in all countries, and at all times: no human laws are of any validity if contrary to this, and such of them as are valid derive all their force, and all their authority, mediately or immediately, from this original.

But in order to apply this to the particular exigencies of each individual, it is still necessary to have recourse to reason; whose office it is to discover, as was before observed, what the law of nature directs in every circumstance of life, by considering what method will tend the most effectually to our own substantial happiness. And if our reason were always, as in our first ancestor before his transgression, clear and perfect, unruffled by passions, unclouded by prejudice, unimpaired by disease or intemperance, the task would be pleasant and easy; we should need no other guide but this. But every man now finds the contrary in his own experience; that his reason is corrupt, and his understanding full of ignorance and error.

Law of revelation.

This has given manifold occasion for the benign interposition of Divine Providence; which, in compassion to the frailty, the imperfection, and the blindness of human reason, hath been pleased, at sundry times and in divers manners, to discover and enforce its laws by an immediate and direct revelation. The doctrines thus delivered we call the *revealed* or *divine law*, and they are to be found only in the Holy Scriptures. These precepts, when revealed, are found upon comparison to be really a part of the original law of nature, as they tend in all their consequences to man's felicity. But we are not from thence to conclude, that the knowledge of these truths was attainable by reason in its present corrupted state; since we find that, until they were revealed, they were hid from the wisdom of ages. As then the moral precepts of this law are indeed of the same original with those of the law of nature, so their intrinsic obligation is of equal strength and perpetuity. Yet undoubtedly the revealed law is of infinitely more authenticity than that moral system which is framed by ethical writers, and denominated the *natural law:* because the one is the law of nature, expressly declared so to be by God himself; the other is only what, by the assistance of human reason, we imagine to be that law. If we could be as certain of the latter as we are of the former, both would have an equal authority; but till then they can never be put in any competition together.

Upon these two foundations, the law of nature and the law of revelation, depend all human laws; that is to say, no human laws should be suffered to contradict these. There are, it is true, a great number of indifferent points, in which both the divine law and the natural leave a man

Law.

at his own liberty, but which are found necessary, for the benefit of society, to be restrained within certain limits. And herein it is that human laws have their greatest force and efficacy; for, with regard to such points as are not indifferent, human laws are only declaratory of, and act in subordination to, the former. To instance in the case of murder: This is expressly forbidden by the divine, and demonstrably by the natural law; and from these prohibitions arises the true unlawfulness of this crime. Those human laws that annex a punishment to it do not at all increase its moral guilt, or superadd any fresh obligation in *foro conscientiæ* to abstain from its perpetration. Nay, if any human law should allow or enjoin us to commit it, we are bound to transgress that human law, or else we must offend both the natural and the divine. But, with regard to matters that are in themselves indifferent, and are not commanded or forbidden by those superior laws; such, for instance, as exporting of wool into foreign countries; here the inferior legislature has scope and opportunity to interpose, and to make that action unlawful which before was not so.

Law of nations.

If man were to live in a state of nature, unconnected with other individuals, there would be no occasion for any other laws than the law of nature and the law of God. Neither could any other law possibly exist; for a law always supposes some superior who is to make it; and in a state of nature we are all equal, without any other superior but him who is the Author of our being. But man was formed for society; and, as is demonstrated by the writers on this subject, is neither capable of living alone, nor indeed has the courage to do it. However, as it is impossible for the whole race of mankind to be united in one great society, they must necessarily divide into many, and form separate states, commonwealths, and nations, entirely independent of each other, and yet liable to a mutual intercourse. Hence arises a third kind of law to regulate this mutual intercourse, called *the law of nations;* which, as none of these states will acknowledge a superiority in the other, cannot be dictated by either, but depends entirely upon the rules of natural law, or upon mutual compacts, treaties, leagues, and agreements, between these several communities; in the construction also of which compacts we have no other rule to resort to but the law of nature, being the only one to which both communities are equally subject; and therefore the civil law very justly observes, that *quod naturalis ratio inter omnes homines constituit, vocatur jus gentium.* See the article on the LAW OF NATIONS.

Municipal or civil law.

To the consideration, then, of the law of nature, the revealed law, and the law of nations, succeeds that of the municipal or civil law; that is, the rule by which particular districts, communities, or nations, are governed; being thus defined by Justinian, "*jus civile est quod quisque sibi populus constituit.*" We call it *municipal* law, in compliance with common speech; for though, strictly, that expression denotes the particular customs of one single *municipium* or free town, yet it may with sufficient propriety be applied to any one state or nation which is governed by the same laws and customs. Municipal law, thus understood, is properly defined to be "a rule of civil conduct prescribed by the supreme power in a state, commanding what is right, and prohibiting what is wrong." Let us endeavour to explain its several properties, as they arise out of this definition.

And, first, it is a *rule;* not a transient sudden order from a superior to or concerning a particular person; but something permanent, uniform, and universal. Therefore a particular act of the legislature to confiscate the goods of Titius, or to attaint him of high treason, does not enter into the idea of a municipal law; for the operation of this act is spent upon Titius only, and has no relation to the community in general; it is rather a sentence than a law. But an act to declare that the crime of which Titius is accused shall be deemed high treason; this has permanency, uniformity, and universality, and therefore is properly a *rule.* It is also called a *rule,* to distinguish it from *advice* or *counsel,* which we are at liberty to follow or not as we see proper, and to judge upon the reasonableness or unreasonableness of the thing advised; whereas our obedience to the law depends not upon *our approbation,* but upon the *maker's will.* Counsel is only matter of persuasion, law is matter of injunction; counsel acts only upon the willing, law upon the unwilling also.

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It is also called a *rule,* to distinguish it from a *compact* or *agreement;* for a compact is a promise proceeding from us, law is a command directed to us. The language of a compact is, "I will, or will not, do this;" that of a law is, "Thou shalt, or shalt not, do it." It is true there is an obligation which a compact carries with it, equal in point of conscience to that of a law; but then the original of the obligation is different. In compacts, we ourselves determine and promise what shall be done, before we are obliged to do it; in laws, we are obliged to act without ourselves determining or promising any thing at all. Upon these accounts law is defined to be "a rule."

Municipal law is also "a rule of *civil conduct.*" This distinguishes municipal law from the natural or revealed; the former of which is the rule of moral conduct; and the latter not only the rule of moral conduct, but also of faith. These regard man as a creature, and point out his duty to God, to himself, and to his neighbour, considered in the light of an individual. But municipal or civil law regards him also as a citizen, and bound to other duties towards his neighbour than those of mere nature and religion; duties which he has engaged in by enjoying the benefits of the common union, and which amount to no more than that he do contribute, on his part, to the subsistence and peace of the society.

It is likewise "a rule *prescribed;*" because a bare resolution, confined in the breast of the legislator, without manifesting itself by some external sign, can never be properly a law. It is requisite that this resolution be notified to the people who are to obey it. But the manner in which this notification is to be made is matter of very great indifference. It may be notified by universal tradition and long practice, which supposes a previous publication, and is the case of the common law of England and of Scotland. It may be notified *viva voce,* by officers appointed for that purpose, as is done with regard to proclamations, and such acts of parliament as are appointed to be publicly read in churches and other assemblies. It may, lastly, be notified by writing, printing, or the like; which is the general course taken with all our acts of parliament. Yet, whatever way is made use of, it is incumbent on the promulgators to do it in the most public and perspicuous manner; not like Caligula, who (according to Dio Cassius) wrote his laws in a very small character, and hung them up upon high pillars, the more effectually to ensnare the people. There is still a more unreasonable method than this, which is called making of laws *ex post facto;* when, after an action (indifferent in itself) is committed, the legislator then for the first time declares it to have been a crime, and inflicts a punishment upon the person who has committed it. Here it is impossible that the party could foresee that an action, innocent when it was done, should be afterwards converted to guilt by a subsequent law: he had therefore no cause to abstain from it; and all punishment for not abstaining must of consequence be cruel and unjust. All laws should be therefore made to commence *in futuro,* and be notified before their commencement; which is implied in the term "prescribed." But when this rule is in the usual manner notified or prescribed, it is then the subject's

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business to be thoroughly acquainted therewith; for if ignorance of what he might know were admitted as a legitimate excuse, the laws would be of no effect, but might always be eluded with impunity.

But further, municipal law is "a rule of civil conduct prescribed *by the supreme power in a state;*" for legislature, as was before observed, is the greatest act of superiority that can be exercised by one being over another. Wherefore it is requisite to the very essence of a law, that it be made by the supreme power. Sovereignty and legislature are indeed controvertible terms; one cannot subsist without the other.

This will naturally lead us into a short inquiry concerning the nature of society and civil government; and the natural inherent right that belongs to the sovereignty of a state, wherever that sovereignty be lodged, of making and enforcing laws.

From what has been advanced, the truth of the former branch of our definition is, we trust, sufficiently evident; that "municipal law is a rule of civil conduct, prescribed *by the supreme power in a state.*" We proceed now to the latter branch of it; that it is a rule so prescribed, "commanding what is right, and prohibiting what is wrong."

Now, in order to do this completely, it is first of all necessary that the boundaries of right and wrong be established and ascertained by law. And when this is once done, it will follow of course, that it is likewise the business of the law, considered as a rule of civil conduct, to enforce these rights, and to restrain or redress these wrongs. It remains therefore only to consider, in what manner the law is said to ascertain the boundaries of right and wrong, and the methods which it takes to command the one and prohibit the other.

For this purpose, every law may be said to consist of several parts: one, declaratory, whereby the rights to be observed, and the wrongs to be eschewed, are clearly defined and laid down; another, directory, whereby the subject is intrusted and enjoined to observe those rights, and to abstain from the commission of those wrongs; a third, remedial, whereby a method is pointed out to recover a man's private rights, or redress his private wrongs: to which may be added a fourth, usually termed the *sanction* or *vindicatory* branch of the law, whereby it is signified what evil or penalty shall be incurred by such as commit any public wrongs, and transgress or neglect their duty.

Decla- ory rt f th aw.

With regard to the first of these, the *declaratory* part of the municipal law, this depends not so much upon the law of revelation or of nature, as upon the wisdom and will of the legislator. This doctrine, which before was slightly touched, deserves a more particular explication. Those rights, then, which God and nature have established, and are therefore called *natural rights,* such as are life and liberty, need not the aid of human laws to be more effectually invested in every man than they are; neither do they receive any additional strength when declared by the municipal laws to be inviolable. On the contrary, no human legislature has power to abridge or destroy them, unless the owner shall himself commit some act that amounts to a forfeiture. Neither do divine or natural *duties* (such as, for instance, the worship of God, the maintenance of children, and the like) receive any stronger sanction from being also declared to be duties by the law of the land. The case is the same as to crimes and misdemeanors, that are forbidden by the superior laws, and therefore styled *mala in se,* such as murder, theft, and perjury; which contract no additional turpitude from being declared unlawful by the inferior legislature. For that legislature in all these cases acts only, as was before observed, in subordination to the Great Lawgiver, transcribing and publishing his precepts. So that, upon the whole, the declaratory part of the municipal law has no force or operation at all, with regard to actions that are naturally and intrinsically right or wrong.

Law.

But with regard to things in themselves indifferent, the case is entirely altered. These become either right or wrong, just or unjust, duties or misdemeanors, according as the municipal legislator sees proper for promoting the welfare of the society, and more effectually carrying on the purposes of civil life. Thus our own common law has declared, that the goods of the wife do instantly upon marriage become the property and right of the husband; and our statute law has declared all monopolies a public offence; yet that right and this offence have no foundation in nature, but are merely created by the law, for the purposes of civil society. And sometimes, where the thing itself has its rise from the law of nature, the particular circumstances and mode of doing it become right or wrong, as the laws of the land shall direct. Thus, for instance, in civil duties, obedience to superiors is the doctrine of revealed as well as natural religion; but who those superiors shall be, and in what circumstances, or to what degrees, they shall be obeyed, is the province of human laws to determine. And so, as to injuries or crimes, it must be left to our own legislature to decide in what cases the seizing another's cattle shall amount to the crime of robbery; and where it shall be a justifiable action, as when a landlord takes them by way of distress for rent.

Directory part.

Thus much for the declaratory part of the municipal law. The *directory* stands much upon the same footing; for this virtually includes the former, the declaration being usually collected from the direction. The law that says, "thou shalt not steal," implies a declaration that stealing is a crime. And we have seen, that, in things naturally indifferent, the very essence of right and wrong depends upon the direction of the laws to do or to omit them.

Remedial part.

The *remedial* part of a law is so necessary a consequence of the two former, that laws must be very vague and imperfect without it. For in vain would rights be declared, in vain directed to be observed, if there were no method of recovering and asserting those rights when wrongfully withheld or invaded. This is what we mean properly when we speak of the protection of the law. When, for instance, the declaratory part of the law has said that "the field or inheritance which belonged to Titius's father is vested by his death in Titius," and the directory part has "forbidden any one to enter on another's property without the leave of the owner;" if Gaius after this will presume to take possession of the land, the remedial part of the law will then interpose its office, will make Gaius restore the possession of Titius, and also pay him damages for the invasion.

With regard to the sanction of laws, or the evil that may attend the breach of public duties, it is observed, that human legislators have for the most part chosen to make the sanction of their laws rather vindicatory than remuneratory, or to consist rather in punishments than in actual particular rewards; because, in the first place, the quiet enjoyment and protection of all our civil rights and liberties, which are the sure and general consequence of obedience to the municipal law, are in themselves the best and most valuable of all rewards; because also, were the exercise of every virtue to be enforced by the proposal of particular rewards, it were impossible for any state to furnish stock enough for so profuse a bounty; and farther, because the dread of evil is a much more forcible principle of human actions than the prospect of good. For which reasons, though a prudent bestowing of rewards is sometimes of exquisite use, yet we find that those civil laws, which enforce and enjoin our duty, do seldom, if ever, propose any privilege or gift to such as obey the law, but do constantly come armed with a penalty denounced against transgressors, either expressly defining the nature and quantity of the punishment, or else leaving it to the discretion of the judges, and those who are intrusted with the care of putting the laws in execution.

Vindicatory part.

Of all the parts of a law, the most effectual is the *vindicatory;* for it is but lost labour to say, "Do this, or avoid that," unless we also declare, "This shall be the consequence of your non-compliance." We must therefore observe, that the main strength and force of a law consists in the penalty annexed to it. Herein is to be found the principal obligation of human laws.

Legislators and their laws are said to *compel* and *oblige:* not that, by any natural violence, they so constrain a man as to render it impossible for him to act otherwise than as they direct, which is the strict sense of obligation; but because, by declaring and exhibiting a penalty against offenders, they bring it to pass, that no man can easily choose to transgress the law; since, by reason of the impending correction, compliance is in a high degree preferable to disobedience. And, even where rewards are proposed as well as punishments threatened, the obligation of the law seems chiefly to consist in the penalty: for rewards, in their nature, can only persuade and allure; nothing is compulsory but punishment.

It has been held true, and very justly, by the principal of our ethical writers, that human laws are binding upon men's consciences. But, if that were the only or most forcible obligation, the good only would regard the laws, and the bad would set them at defiance. And, true as this principle is, it must still be understood with some restriction. It holds, we apprehend, as to *rights;* and that, when the law has determined the field to belong to Titius, it is a matter of conscience no longer to withhold or to invade it. So also in regard to *natural duties,* and such offences as are *mala in se.* Here we are bound in conscience, because we are bound by superior laws, before those human laws were in being, to perform the one and abstain from the other. But in relation to those laws which enjoin only positive duties, and forbid only such things as are not *mala in se,* but *mala prohibita* merely, without any intermixture of moral guilt, annexing a penalty to non-compliance; here conscience seems to be no farther concerned, than by directing a submission to the penalty, in case of our breach of those laws: for otherwise the multitude of penal laws in a state would not only be looked upon as an impolitic, but would also be a very wicked thing, if every such law were a snare for the conscience of the subject. But in these cases the alternative is offered to every man; "either abstain from this, or submit to such a penalty;" and his conscience will be clear, whichever side of the alternative he thinks proper to embrace. Thus, by the statutes for preserving the game, a penalty is denounced against every unqualified person that kills a hare, and against every person who possesses a partridge in August. And so too, by other statutes, pecuniary penalties are inflicted for exercising trades without serving an apprenticeship thereto, for erecting cottages without annexing four acres of land to each, for not burying the dead in woollen, for not performing statute work on the public roads, and for innumerable other positive misdemeanors. Now these prohibitory laws do not make the transgression a moral offence, or sin; the only obligation in conscience is to submit to the penalty, if levied. It must, however, be observed, that we are here speaking of laws that are simply and purely penal, where the thing forbidden or enjoined is wholly a matter of indifference, and where the penalty inflicted is an adequate compensation for the civil inconvenience supposed to rise from the offence. But where disobedience to law involves in it also any degree of public mischief or private injury, there it falls within our former distinction, and is also an offence against conscience.

We have now gone through the definition laid down of a municipal law; and have shown that it is "a rule of civil conduct, prescribed by the supreme power in a state, commanding what is right, and prohibiting what is wrong;" in the explication of which we have endeavoured to interweave a few useful principles concerning the nature of civil government, and the obligation of human laws. Before we conclude this part, it may not be amiss to add a few observations concerning the interpretation of laws.

Interpretation of laws.

When any doubt arose upon the construction of the Roman laws, the usage was to state the case to the emperor in writing, and take his opinion upon it. This was certainly a bad method of interpretation. To interrogate the legislature to decide particular disputes, is not only endless, but affords great room for partiality and oppression. The answers of the emperor were called his rescripts, and these had in succeeding cases the force of perpetual laws; though they ought to be carefully distinguished, by every rational civilian, from those general constitutions which had only the nature of things for their guide. The Emperor Macrinus, as his historian Capitolinus informs us, had once resolved to abolish these rescripts, and retain only the general edicts: he could not bear that the hasty and crude answers of such princes as Commodus and Caracalla should be reverenced as laws. But Justinian thought otherwise, and he has preserved them all. In like manner, the canon laws, or decretal epistles of the popes, are all of them rescripts in the strictest sense. Contrary to all true forms of reasoning, they argue from particulars to generals.

The fairest and most rational method to interpret the will of the legislator, is by exploring his intentions at the time when the law was made, by signs the most natural and probable. And these signs are either the words, the context, the subject-matter, the effects and consequence, or the spirit and reason of the law. Let us take a short view of them all.

1. *Words* are generally to be understood in their usual and most known signification; not so much regarding the propriety of grammar, as their general and popular use. Thus the law mentioned by Puffendorf, which forbade a layman to lay hands on a priest, was adjudged to extend to him who had hurt a priest with a weapon. Again: Terms of art, or technical terms, must be taken according to the acceptation of the learned in each art, trade, and science. So, in the act of settlement, where the crown of England is limited "to the Princess Sophia, and the heirs of her body being Protestants," it becomes necessary to call in the assistance of lawyers to ascertain the precise idea of the words "heirs of her body," which, in a legal sense, comprise only certain of her lineal descendants. Lastly, Where words are clearly repugnant, in two laws, the latter law takes place of the elder; *leges posteriores priores contrarias abrogant,* is a maxim of universal law, as well as of our own constitutions. And accordingly it was laid down by a law of the twelve tables at Rome, *Quod populus postremum jussit, id jus ratum esto.*

2. If words happen to be still dubious, we may establish their meaning from the *context;* with which it may be of singular use to compare a word or a sentence, whenever they are ambiguous, equivocal, or intricate. Thus the proëme, or preamble, is often called in to help the construction of an act of parliament. Of the same nature and use is the comparison of a law with other laws that are made by the same legislator, that have some affinity with the subject, or that expressly relate to the same point. Thus, when the law of England declares murder to be felony without benefit of clergy, we must resort to the same

law of England to learn what the benefit of clergy is; and, when the common law censures simoniacal contracts, it affords great light to the subject to consider what the canon law has adjudged to be simony.

3. As to the *subject-matter*, words are always to be understood as having a regard thereto; for that is always supposed to be in the eye of the legislator, and all his expressions directed to that end. Thus, when a law of Edward III. forbids all ecclesiastical persons to purchase provisions at Rome, it might seem to prohibit the buying of grain and other victual; but when we consider that the statute was made to repress the usurpations of the papal see, and that the nominations to benefices by the pope were called *provisions*, we shall see that the restraint is intended to be laid upon such provisions only.

4. As to the effects and *consequence*, the rule is, That where words bear either none, or a very absurd signification, if literally understood, we must a little deviate from the received sense of them. Therefore the Bolognian law, mentioned by Puffendorf, which enacted, "that whoever drew blood in the streets should be punished with the utmost severity," was held after long debate not to extend to the surgeon who opened the vein of a person who fell down in the street with a fit.

5. But, lastly, the most universal and effectual way of discovering the true meaning of a law, when the words are dubious, is by considering the *reason* and *spirit* of it, or the cause which moved the legislator to enact it. For when this reason ceases, the law itself ought likewise to cease with it. An instance of this is given in a case put by Cicero, or whoever was the author of the rhetorical treatise inscribed to Herennius. There was a law, that those who in a storm forsook the ship, should forfeit all property therein, and the ship and lading should belong entirely to those who staid in it. In a dangerous tempest, all the mariners forsook the ship, except only one sick passenger, who, by reason of his disease, was unable to get out and escape. By chance the ship came safe to port. The sick man kept possession, and claimed the benefit of the law. Now here all the learned agree, that the sick man is not within the reason of the law; for the reason of making it was, to give encouragement to such as should venture their lives to save the vessel; but this is a merit which he could never pretend to, who neither staid in the ship upon that account, nor contributed any thing to its preservation.

Equity.

From this method of interpreting laws by the reason of them, arises what we call *equity*, which is defined by Grotius, "the correction of that, wherein the law (by reason of its universality) is deficient." For since in laws all cases cannot be foreseen or expressed, it is necessary that, when the general decrees of the law come to be applied to particular cases, there should be somewhere a power vested of defining those circumstances which (had they been foreseen) the legislator himself would have expressed. And these are the cases which, according to Grotius, *lex non exacte definit, sed arbitrio boni viri permittit.*

Equity thus depending essentially upon the particular circumstances of each individual case, there can be no established rules and fixed precepts of equity laid down, without destroying its very essence, and reducing it to a positive law. And, on the other hand, the liberty of considering all cases in an equitable light must not be indulged too far, lest thereby we destroy all law, and leave the decision of every question entirely in the breast of the judge. And law without equity, though hard and disagreeable, is much more desirable for the public good than equity without law, which would make every judge a legislator, and introduce infinite confusion; as there would then be almost as many different rules of action laid down in our courts, as there are differences of capacity and sentiment in the human mind.

For some account of the laws and judicial establishments of England and Scotland, and generally of the principal countries of Europe, the reader is referred to the respective articles concerning them in this work.

LAW, *Canon.* See CANON LAW.
LAW, *Civil.* See CIVIL LAW.
LAW, *Feudal.* See FEUDAL LAW.
LAW, *Maritime.* See MARITIME LAW.
LAW, *Mercantile.* See MERCANTILE LAW.
LAW, *Military.* See MILITARY LAW.
LAW, *Mosaic.* See MOSAIC LAW.

LAW OF NATIONS.

I.—*Ideas involved in the term Law.—These ideas how modified in the term Law of Nations.—The only sanction applicable to the Law of Nations is the popular sanction.—What dependence may be placed upon the popular sanction.*

IN the meaning of the word Law, three principal ideas are involved; that of a command, that of a sanction, and that of the authority from which the command proceeds.

Every law imports that something is to be done, or to be left undone.

But a command is impotent, unless there is the power of enforcing it. The power of enforcing a command is the power of inflicting penalties if the command is not obeyed. And the applicability of the penalties constitutes the sanction.

There is more difficulty in conveying an exact conception of the authority which is necessary to give existence to a law. It is evident that it is not every command, enforced by penalties, to which we should extend such a title. A law is not confined to a single act; it embraces a class of acts: it is not confined to the acts of one man; it embraces those of a community of men. And the authority from which it emanates must be an authority which that community are in the habit of obeying. An authority to which only a temporary obedience is paid, does not come up to the notion of that authority which is requisite to give existence to laws; for thus the commands of a hostile army, committing plunder, would be laws.

The conditions which we have thus described may all be visibly traced in the laws which governments lay down for the communities to which they belong. There we observe *the command*, there *the punishment* prescribed for its violation, and there *the commanding authority* to which obedience is habitually paid.

Of these conditions, how many can be said to belong to any thing included under the term Law of Nations?

By that term is understood, something which either does, or which, it is supposed, ought to bind the conduct of one nation towards another.

But it is not understood that one nation has a right to command another. When one nation can be commanded by another, it is dependent upon that other; and the laws of dependence are different from those which we are at present considering. An independent nation would resent, instead of obeying, a command delivered to it by another. Neither can it properly be said that nations, taken aggregately, prescribe those laws to one another severally; for when did they ever combine in any such prescription? When did they ever combine to vindicate the violations of them? It is therefore clear, that the term command cannot be applied, at least in the ordinary sense, to the laws of nations.

In the next place, it would not seem that any thing deserving the name of sanction belongs to them. Sanction, we have already seen, is punishment. Suppose nations to threaten one another with punishment, for the violation of any thing understood to be a law of nations. To punish implies superiority of strength. For the strong, therefore, the law of nations may perhaps have a sanction as against the weak. But what can it have as against the strong? Is it the strong, however, or is it the weak, by whom it is most liable to be violated? The answer is obvious and undeniable. As against those from whom almost solely any violation of the laws of nations need be apprehended, there appears, therefore, to be no sanction at all.

If it be said that several nations may combine to give it a sanction in favour of the weak, we might, for a practical answer, appeal to experience. Has it been done? Have nations in reality combined, so constantly and steadily, in favour of the law of nations, as to create, by the certainty of punishment, an overpowering motive to unjust powers, to abstain from its violation? For, as the laws against murder would have no efficacy if the punishment prescribed were not applied once in fifty or a hundred times, so the penalty against the violations of the law of nations can have no efficacy if it is applied unsteadily and rarely.

On the mode in which it has been applied, we may appeal to a great authority. Montesquieu says, "Le droit public est plus connu en Europe qu'en Asie: cependant on peut dire que les passions des princes, la patience des peuples, la flatterie des ecrivains, en ont corrompu tous les principes. Ce droit, tel qu'il est aujourd'hui, est une science qui apprend aux princes jusqu'à quel point ils peuvent violer la justice, sans choquer leurs intérêts." (*Lettres Persanes*, xciv.)

To go a little deeper, we may consider whether the interest of nations, that which in the long run governs them all, can ever produce combinations, from which an effectual sanction, of the nature in question, can be expected to proceed. That they would derive some advantage from the general observation of those maxims which have been called laws of nations, frivolous as are the points upon which the greater part of them turn, cannot be denied. These advantages, however, are seen at a distance, and with the mind's eye; they are speculative rather than sensible. The inconveniences, on the other hand, which must result from any movement to lend effect to the law of nations, are immediate and formidable; the whole train of the evils of war are almost sure to arise from them. The latter class of impressions must, in general, be far more powerful than the former; and thus the interposition in favour of the law of nations will generally be shunned. A nation is often but too easily stimulated to make war in resentment of injuries done to itself. But it looks with too much coolness upon the injuries done to other nations, to incur the chance of any great inconvenience for the redress of them.

Besides, the object is to be gained by the means of combination. But the combinations of nations are very difficult things. Nations hardly ever combine without quarrelling.

Again, all nations ought to combine for an object common to all. But for all nations to combine in any one enterprise is impossible. Suppose a prince to have violated the law of nations, it would be absurd to suppose that all the countries on earth should conspire to punish him. But if not all, what is to be the selection? Who shall come forward; who stand excused? By those who are condemned to the sacrifice, in what proportion are the contributions to be made? Who is to afford the greatest, and who may come with the least?

It is unnecessary to pursue any farther the analysis of this extraordinary hypothesis. It is evident, from what has been said, that it is full of impracticabilities.

Are we, then, obliged to consider the maxims or rules which pass under the name of Laws of Nations, as utterly without force and influence; and the discourse which is made about them as mere affectation and impertinence?

Not wholly so. It is of use that the ordinary intercourse of nations should be conducted according to certain forms, generally known and approved; because they will be observed on all occasions when there is no particular motive to violate them, and will often prevent disputes which might arise on frivolous occasions. They resemble in this respect the ceremonial of a court, or the established forms of polished society.

The objects, however, which are understood to be embraced by the law of nations, are of two sorts. The first are those minor objects which partake more of form than of substance; the other are objects which deeply affect humanity. That there are certain interests of nations, which it were good to have considered as their rights, and of which it is infinitely to be desired that the violation could be prevented, is most true. But if national law has no penalty annexed to it; if the weaker party who is wronged has no means of redress, where, it may be said, is the advantage of such a law? Or where the propriety of calling that a law which is only a declaration respecting rights; violated by the more powerful party with impunity, as often, and to as great an extent, as he pleases?

There is still, however, a power which, though it be not the physical force either of one state or of a combination of states, applied to vindicate a violation of the law of nations, is not without a great sway in human affairs; and which, as it is very nearly the whole of the power which can be applied to secure the observation of that law, deserves to be carefully considered, that, by duly appreciating its efficacy in this important affair, we may neither trust to it where it will disappoint our expectation, nor neglect the use of it where it may be turned to advantage.

That the human mind is powerfully acted upon by the approbation or disapprobation, by the praise or blame, the contempt and hatred, or the love and admiration, of the rest of mankind, is a matter of fact, which, however it may be accounted for, is beyond the limits of dispute. Over the whole field of morality, with the exception of that narrow part which is protected by penal laws, it is the only power which binds to good conduct, and renders man agreeable and useful to man. It is evident, also, that where there is not great inequality, it is a power, the binding force of which must be necessarily great; because every individual, considered in himself, is weak and helpless as compared with the rest of the community. Unless, therefore, he can prevail upon them to abstain from injuring him, he must be exposed to unlimited suffering. And if, on the other hand, he can prevail upon them to combine in doing, or in desiring to do, him good, he is put in the way of receiving perpetually the greatest advantages. His motive, therefore, to obtain the favourable and to avoid the unfavourable regards of the members of the society in which he lives, is of the highest order. But he can obtain their favourable, and avoid their unfavourable sentiments, only by abstaining, with scrupulous anxiety, from doing any injury to them, and observing all such modes of conduct as are calculated to be useful and agreeable to them.

The value which men set upon these favourable regards of the persons among whom they live, is strikingly manifested by some of the most ordinary forms of their discourse and behaviour. What is more esteemed than character? What injury reckoned more deep and unpardonable, than that of the man who exerts himself to take away unworthily any part of the reputation of his neighbours? But what is character, if not the title to the favourable sentiments of other men? And what is the loss of character, but the opinion of other men that we do not deserve those favourable sentiments with which they have been accustomed to regard us?

Honour and shame, those emotions, the intensity of which is proved by so many phenomena of human life, are but the feelings which attend upon those different situations. When a man finds himself in possession of the love, the esteem, and admiration of those by whom he is surrounded, he is filled with that delight which the belief of the secure possession of a great source of benefit cannot fail to inspire: he is fearless, elated, and confident; the principal characteristics of that state of mind which we denominate pride. When he is conscious, on the other hand, of having forfeited in any degree the favourable sentiments of those among whom he lives, he suffers that depression which the loss of a highly valued possession is calculated to create; he ceases, in some degree, to look forward to his fellow-men for good, and feels more or less the apprehension of evil at their hands; he fears to prove how far their disapprobation of him reaches, or to excite them to define it too accurately for themselves; he hangs down his head, and dares not so much as look them in the face.

When men are favourably situated for having those impressions deeply struck, or, more correctly speaking, when those combinations of ideas have consistently and habitually been presented to their minds, the association becomes at last so indissoluble and strong, as to operate, even where the connection among the things themselves may not exist.

When persons who have been educated in a virtuous society have, from their infancy, associated the idea of certain actions with the favourable sentiments, and all the advantages which flow from the favourable sentiments, of mankind; and, on the other hand, have associated the idea of certain other actions with the unfavourable sentiments, and all the disadvantages which flow from the unfavourable sentiments, of mankind; so painful a feeling comes in time to be raised in them at the very thought of any such action, that they recoil from the perpetration of it, even in cases in which they may be perfectly secure against any unfavourable sentiments which it might be calculated to inspire.

It will, we apprehend, upon the most accurate investigation, be found, that this is the only power to which we can look for any considerable sanction to the laws of nations; for almost the only species of punishment to which the violation of them can ever become amenable: it is the only security, therefore, which mankind can ever enjoy for the benefit which laws, well contrived for this purpose, might be calculated to yield.

It is, in the next place, incumbent upon us to inquire, what dependence can be placed upon this security, in the set of cases now under consideration; and in what circumstances it is calculated to act with the greatest, in what with the least efficacy, towards this important end.

A power which is wholly derived from the good which may follow the favourable, the evil which may follow the unfavourable, sentiments of mankind, will act most efficaciously upon him who is the most, least efficaciously upon him who is the least, exposed to receive good and evil from the immediate inclination of his fellow-men.

It seems to be evident, that he who is most weak, as compared with the rest of the community, is the most exposed to receive good or evil in consequence of their favourable or unfavourable sentiments; and that he, on the other hand, who is the most powerful, as compared with them, is the least exposed to receive good or evil in consequence of those sentiments.

When men are nearly upon equality, no one has any chance of inducing other people to abstain from hurting him, but by his abstaining from doing hurt in any way to them. He has no means of inducing them to do him any acts of service, but by their expectation of receiving similar acts of service from him. He is, therefore, intensely interested in its being generally believed of him, that he is a man who is careful to abstain from injuring, and ever ready to exert himself to do services to others.

The case is exceedingly different where one man is lifted high above others. In that case, he has powerful means of protection against their hurtful acts, powerful means of obtaining their services, altogether independent of his conduct, altogether independent of his disposition either to abstain from injuring them, or to render them service.

So far, therefore, as good conduct arises from a man's dependence upon the sentiments of others; and from this is derived the moral power, to which alone the term moral sanction or obligation can properly belong; the security for good conduct is apt to be lessened, in exact proportion as any one is raised above the level of those composing the mass of the community. If any man possesses absolute power over the rest of the community, he is set free from all dependence upon their sentiments. In this, or nearly in this situation, is every despot having a well-established authority. So far as a man is educated as a despot, he can therefore have but few of those associations on which a conduct beneficent to others depends. He is not accustomed to look, for the services which he needs, or the evils which he apprehends, from others, to the opinion which they may entertain of the goodness or badness of his conduct; he cannot, therefore, have that salutary train of transitions from the idea of an evil act to that of the condemnatory sentiments of mankind, and from the condemnatory sentiments of mankind to the forfeiture of all those delights and advantages which spring to him from the operation of their favourable regards; associations which in men favourably situated become at last habitual, and govern the conduct, as it were mechanically, without any distinct recurrence to the consequences, upon the thought of which, nevertheless, this salutary and ennobling sentiment ultimately depends, and from which it has been originally derived.

If such is the situation of the despot with regard to these important associations, it is in a proportional degree the situation of all those who partake of that species of elevation. In an aristocratical country, for example, a country in which there is great inequality of wealth, those who possess the large fortunes are raised to a great degree above any chance of receiving evil, or of standing deprived of any good, because the great mass, the lower orders, of their countrymen, think unfavourably of them. They are, no doubt, to a considerable degree dependent upon what the people of their own class may think of them; and it is accordingly found, that those qualities and acts which are useful to that class are formed into a particular, an aristocratical code of morality, which is very effectually sanctioned by the favourable and unfavourable sentiments of the aristocratical body, at the same time that it is exceedingly different from that more enlarged and all-comprehensive code, on which the happiness of the greatest number depends, and to which alone the epithet moral in propriety belongs.

Such being the state of the facts connected with this important case, it remains to see what are the inferences bearing upon it which we are entitled to draw from them.

We have already ascertained, that the only power which can operate to sanction the laws of nations, in other words, to reward or punish any nation, according as it obeys or as it disobeys them, is the approbation and disapprobation of mankind. It follows, that the restraining force is, in this case, determined by the associations which they who govern it may have formed with the approbation and disapprobation of mankind. If they have formed strong associations of a pleasurable kind with the approbation, strong associations of the painful kind with the disapprobation, of mankind, the restraining force will be great; if they have not formed such associations, it will be feeble and insignificant. It has, however, appeared, immediately above, that the rulers of a country, of which the government is either monarchical or aristocratical, can have these associations in but a very low degree; as those alone, who are placed on a level with the great body of other men, are placed in circumstances calculated to produce them. It is only then in countries, the rulers of which are drawn from the mass of the people, in other words, in democratical countries, that the sanction of the laws of nations can be expected to operate with any considerable effect.

II.—*What is required to give to the Law of Nations its greatest perfection.—Necessity for a Code of International Law.—Rights of Nations.*

Having thus ascertained what is the power which restrains from violating the laws of nations, and what the description of rulers upon whom its restraining force is the greatest, we are next to inquire by what expedients the force of it may be raised to the greatest pitch, and the greatest amount of benefit may be derived from it.

It is sufficiently recognised, that whatever is intended to produce any effect as a punishment, produces it in a greater degree, in proportion as it operates with greater precision and certainty. The inquiry, then, regards the means of giving precision and certainty to those sentiments of the world, on which the binding power of the laws of nations so greatly depends.

Two things are necessary to give precision and certainty to the operation of laws within a community. The one is a strict determination of what the law is; the second, a tribunal so constituted as to yield prompt and accurate execution to the law. It is evident that these two are indispensable requisites. Without them no penalties can operate with either precision or certainty. And the case is evidently the same, whether we speak of the laws which regulate the actions of individual and individual within the state, or those which regulate the actions of one state towards another.

It is obvious to remark, in the first place, that, with regard to the laws of nations, not one of those two indispensable requisites has ever yet had any existence. It has neither been determined what the laws in question are, nor has any common tribunal for cognizance of the violations of them ever been constituted. With respect to the last, not so much as the idea of it seems to have been entertained. And with respect to the first, though much has been written, it has been almost wholly in the way of vague and general discourse. Hardly a single accurate definition has yet been applied to any part of the subject.

Here, then, we come to what is obviously the grand inquiry; namely, *first*, what can be done towards defining the laws of nations? and, *secondly*, what can be done towards providing a tribunal for yielding prompt and accurate decisions in conformity with them? in other words, for applying with the greatest possible efficacy the opinion of the world for restraining the violation of them?

In the article Jurisprudence, to which it is necessary for us here to revert, we have sufficiently made it appear, that the foundation of all law is the constitution of rights. Of two parties, unless it is previously determined what each shall enjoy, it can never be determined whether one has improperly disturbed the enjoyment of the other. To determine, however, what a party is to enjoy, is to determine his rights.

Now then, with regard to nations, the question is, what ought to be constituted rights? or, in other words, what would it be desirable for the good of mankind upon the whole, that the several nations should respect as the rights of each other?

This, it is pretty obvious, is one of the most extensive of all inquiries, far exceeding the limits of an article in the present work. We can attempt little more than to show the way in which the inquiry may be carried on.

In the article Jurisprudence, we have endeavoured to clear up the meaning which in legislation can, without leading to confusion, be alone attached to the term *rights;* and we have there likewise seen, that there are but two classes of objects in which individuals can have rights, namely, things and persons.

The case, we believe, will be found the same with respect to nations. They also can have rights in nothing but persons and things. Of course it follows that they can receive injury in nothing but in persons or things.

The inquiry, however, with respect to the rights of nations, is not so simple as that with respect to the rights of individuals; because, between individuals subject to the same system of laws, the legislature recognises no state of hostility; but between nations there is the state of war and the state of peace, and the rights which are understood to belong to nations are different in these two different states. In the state of war, nations recognise in one another very few rights respecting either persons or things; they kill the one, and take and destroy the other, with little other limit than the want of ability. In the state of peace they respect as rights belonging to one another, nearly the same things which are constituted rights of individuals, by the ordinary systems of national law.

III.—*What should be recognised as Rights in time of Peace.—The Property of Individuals.—The Persons of Individuals.—The Property or Dominion of the State.—Dominion in Land.—Dominion in Water.*

We shall begin with the consideration of those things which it would be desirable that nations should respect as the rights of one another in the time of peace.

And, *first,* of rights with respect to things. As the subject of the rights of nations, things may be divided into two sorts; things belonging to some individual member of the nation, and things belonging to the nation in its collective or corporate capacity.

Those rights in things which the nation guarantees to its individual members within the nation, it would be desirable, with hardly any exception, that nations should respect in regard to one another; that those things, for example, which the government of the country to which a man belongs, would regard, and would compel all its subjects to regard, as his property, the governments of all other countries should respect, and compel all their subjects to respect as his property.

There are two states of circumstances in which questions may arise between nations, respecting the property of their respective subjects. The first, where the property in question, when the cause of dispute arises, is within the country of the individual to whom it belongs. The second, where the property has by its owner been previously removed into the foreign country, with which, or some of the inhabitants of which, the dispute has arisen.

1. The first set of circumstances exists between two conterminous countries, the bordering inhabitants of which being neighbours to one another, may, as any other neighbours, infringe the properties of one another. The proper mode of settling these disputes seems to be sufficiently obvious. The rights of the party complaining should be adjudged according to the laws of the country to which he belongs. But the party sued or prosecuted should be amenable only to the tribunals of the country to which he belongs; that is to say, the question should be tried before the tribunals of the country of the defendant; but the definition of the right in question should be taken from the law of the country to which the plaintiff belongs. It might in some cases be convenient for countries in this situation to agree in constituting a common judicature, appropriated to these disputes, to consist, for example, of two judges, one of each country, with power to choose a third when they could not agree.

The injury complained of may be capable of redress by a remedy of the nature of a civil suit merely; or it may be of that more atrocious sort, theft or robbery, for which the remedy of punishment is required.

It would appear that punishment ought to be apportioned according to the laws of the country to which the party who has incurred it belongs. Whatever would be the punishment decreed for the offence, if committed against a man of his own country, such a punishment he ought to sustain for the offence against the man of the other country. The question of punishment is here understood as extraneous to that of compensation. This ought always to be made to the party injured, where it is capable of being made, and in a case of property it is always capable; if not by the author of the injury, from want of property, or other cause, at least by the government of the country to which he belongs.

2. Where a man has removed his property from his own into another country, there seems to be no peculiar reason why it should be regulated by any other laws than those of the country into which he has removed it; why the rights which it confers should be otherwise determined, or the violation of them otherwise punished.

We have now considered, though in a very general manner (and our limits preclude us from attempting any thing more), the mode in which nations should agree about the rights of one another (in other words, the laws they should establish), in as far as the property of individuals belonging to them is concerned. After the *property* of individuals, their *persons* are to be considered as requiring the protection of laws.

There is more difficulty in determining what is desirable, as international law, with regard to this part of the subject, than that which regards the property of individuals. It is desirable that the persons of the inhabitants of every country should receive protection according to the laws of their own country; but it is also desirable that each man should sustain punishment according to the laws of his country; and these two objects are to a certain extent inconsistent with one another.

The inconvenience, however, seems to be greater, in permitting the inhabitants of one country to be punished according to the laws of another, than in leaving the inhabitants of one country to the same measure of protection against injury to their persons from the inhabitants of other countries, as is afforded to the inhabitants of those countries by their own laws. Many cases, indeed, may be conceived, in which this is a measure of protection which all reasonable men would allow to be inadequate. In such cases, however, the only remedy seems to be the formation of a compact, by which a mode of proceeding, agreeable to the sentiments of both parties, may be positively prescribed. This latter expedient is of course extraneous to that equitable construction which ought to be uniformly applied by the tribunals of one country to the injuries perpetrated, by those whom they may have to judge, upon the inhabitants of another country. If an inhabitant of Persia, for example, should force cow-broth down the throat of an inhabitant and native of Hindustan, the tribunals of Persia should not punish this outrage as they would punish one Persian for making another swallow the same liquid. To the Persian it would be a trifling injury, and more than a trifling punishment would not be required. To the Hindu it would be one of the greatest of all conceivable injuries. It ought to be, therefore, put upon the same footing with an injury of an equal degree done to a Persian; the nature of the injury, not the external act, should be the object of consideration; and whatever the punishment which would be awarded against a Persian for one of the greatest injuries of which he could be guilty to a Persian, the same ought to be inflicted upon him for this, one of the greatest which he could occasion to a Hindu.

Besides the cases in which a government, as representative of the country, may be injured through the individuals who live under its protection, there are cases in which it may be injured more directly. Certain things belong as property to the government, without belonging to any individual; and there are persons, members of the government, or agents of the government, who may receive injuries in that capacity, distinct from those which affect them as private individuals. These are the cases to which it now remains that we direct our attention.

Those things which belong to government as goods and chattels; its moveables, for example; or the lands which it holds, as any individual holds them, in the way of an estate; there seems to be no reason for considering as subject to any other rules than those applicable to the goods and chattels which belong to individuals.

Of other things, those to which any government can claim a right, as representative of a nation, must be either, first, portions of land, or, secondly, portions of water.

1. The questions which relate to the rights which any nation may claim in any portion of land, are questions regarding boundaries; and these involve the whole of the questions respecting the acquisition of dominion.

To have any standard for determining questions with regard to dominion, the different modes of acquiring dominion must be recognised; those which are proper to be allowed and respected by other nations must be distinguished from those which are improper, must be accurately defined, and the definitions made known.

For this purpose it is easy to perceive that the same process is necessary as that for the definition of rights, described at some length in the article in this work entitled JURISPRUDENCE, to which we must again refer.

It is necessary, according to that example, that the events which are to be considered as giving commencement to a right of dominion, and those which are to be considered as putting an end to it, should be fully enumerated, and accurately defined.

This is the first part of the process. The other part is, to distinguish the different degrees of dominion. There is a dominion which is perfect, which includes every power over the subject in question, and leaves nothing farther to be acquired, a *dominium plenum;* there is also a dominion, which is but the commencement, as it were, of dominion, and includes the smallest possible fragment of a full dominion. These are the two extremes; and between them are various distinguishable degrees. All these should be fully enumerated, and accurately defined.

When any of those events occurs which are to be considered as giving commencement to rights, it often happens that they are accompanied by circumstances which limit the right they would otherwise convey, and render the dominion less than full. These circumstances ought also to be completely enumerated, and the power of each to be accurately defined.

If this were done, an international code would be composed, in which the rights of dominion would be accurately defined; and to determine any question about boundaries, or about the degree of dominion, nothing farther would then be necessary than an adequate inquiry respecting the state of the facts.

The questions would exactly resemble those which we have already described in the article JURISPRUDENCE, in analyzing what is called pleading in judicature. In a question about boundaries there is, let us suppose, a district over which one country affirms that it has a right of dominion, a dominion more or less complete, and another country denies that it has that right. The first question is, whether any of those events has occurred which would give the affirming country a right of dominion? The second question is, whether, if such an event had occurred, it was accompanied with any of those circumstances which limit dominion, and render it less than full; and if so, under what degree of limiting power they are classed? The third question is, whether, if an event thus giving commencement to a right of dominion had occurred, any other event putting an end to that right had subsequently occurred?

We need not here enlarge upon these several topics, because they will be sufficiently understood by those readers who bear in mind the expositions already given in the article referred to; and to those who do not, we suggest the propriety of recurring to that article, as a preparation for the perusal of this.

It is evidently disproportionate to the limits which we must here prescribe to ourselves, to enumerate the events which it would be agreeable to the interests of mankind in general that nations should regard as giving, and alone giving, commencement and termination to rights of dominion, because, in order to afford an enumeration which would be in any degree instructive, the reasons must be given why one set of events, and not another, should have the privilege in question conferred upon them.

It may be proper, however, in the mean time, to observe, that the events in question will not be found to be numerous, nor very difficult to discover. In fact they are, and among civilized nations almost always have been, pretty nearly agreed upon; and they are the questions of modification, and questions of fact, upon which chiefly differences have arisen. For example, there is no dispute that occupancy, where there is no prior right, is an event which should be considered as giving commencement to a right of dominion. Neither is there any doubt that the consent of those who have a right may transfer that right to others; or, in other words, that such consent is an event which gives commencement to a right in those others. Conquest, also, made in a lawful war, is recognised as an event of the same description; and it will be found upon inquiry that these do in fact constitute the whole. For, on every occasion on which dominion is acquired, the territory so acquired must beforehand either have belonged to somebody, or have belonged to nobody. If it belonged to nobody, occupancy is the only event which can be supposed to give commencement to the right. If it belonged to somebody, it must be taken from him, either willingly or by force. If it is taken from him willingly, we have his consent. If it is taken by force, it is by conquest in war that the new right is created.

It is evidently, however, farther necessary, that the different species of consent should be distinguished, and those to which it would be proper to attach this investitive power separated accurately from those from which it should be withheld. It is here, accordingly, that the doctrine of contracts would need to be introduced; that the different species of them applicable to this subject, in which all treaties would be included, should be enumerated; that the effects proper to be given to each of them should be defined; and the mode of interpreting them, or fixing the sense which they ought to bear, accurately laid down.

It would also be expedient, after the principal contracts applicable to international concerns are ascertained, to exhibit in the international code, *formulæ*, with blanks to be filled up, which should be employed by nations on all occasions of such contracts; and, being framed with the greatest possible accuracy, would go as far as it would be possible by words to go, in excluding ambiguity and the grounds of dispute.

With respect to conquest, the last event calculated to give commencement to rights of dominion mentioned in the above general enumeration, it is allowed, that as there are some conquests which ought not to be considered as conferring rights of dominion, there are others which ought to be considered as doing so. It is evidently necessary, therefore, that the line of separation should be drawn.

Whether a conquest, however, should or should not be considered as conferring a right of dominion, depends very much upon the nature of the war through which it is made. If the war be what is regarded as just, and the mode of warfare conformable to the recognised rules, the conquest is apt to be regarded as conferring a legitimate title; if the war, and mode of war, be of a contrary description, the validity of the title conferred by the conquest may be liable to dispute.

It is evident, therefore, that in order to define the species of conquest on which the investitive power in question should be conferred, the circumstances which render a war justifiable, and the mode in which it is justifiable to carry it on, must first be ascertained. This forms the second part of our inquiry; and the question regarding the investitive power of conquest must be deferred till that inquiry is performed.

2. Having thus far considered the mode in which should be determined the rights which nations acquire over portions of territory or land, it remains that we consider the mode in which their rights should be determined with regard to waters.

Waters, as concerns the present purpose, are either rivers or the sea.

As the sea involves the questions of greatest extent and importance, we shall attend to that part of the subject first.

Even in the language of ordinary discourse, the sea is denominated the common domain of nations.

The first principle with regard to the sea is this, that all nations have an equal right to the use of it. The utility of recognising this principle is so apparent, that it has never been the subject of any dispute. And all the rights assigned to nations severally in the enjoyment of this common domain ought to rise out of this principle, and to be limited by it. Whatever use any nation makes of it, should be such as not to prevent a similar and equal use from being made by other nations. And every use which cannot be shown to have that effect, should be recognised as a right by the law of nations.

The principal use which nations make of the sea is that of a passage for their ships. Agreeably to the principle which we have recognised, the ships of one nation should pass in such a manner as not to obstruct the passage of those of another. The rules according to which the possible cases of interference should be regulated are very simple, and are, in fact, laid down and acted upon with considerable accuracy. They resemble in all respects those according to which the vessels of the same country are made to avoid and to regulate their interferences in the rivers of the country, or upon its coasts. There would be no difficulty, therefore, in making accurate definitions of the requisite rights, for insertion in the international code.

The rights being established, the violations of them should be punished, on the same principles as those which we have laid down in regard to the preceding cases. Either property has been injured, or persons. In either case, compensation is an indisputable part of the remedial process, wherever it is practicable. In loss of property it is fully practicable. It is also practicable in many of the injuries done to the person. As in the case of offences committed on land, the rights of the individual who has suffered should be estimated according to the laws of the country to which he belongs; but the punishment of the offender should be measured according to the laws of the country to which he belongs. In the case of piracy, which is robbery or murder committed by persons whom no country recognises, and upon whom, therefore, justice can be demanded from no foreign government, it has hitherto been the practice that the nation suffering has taken the punishment into its own hands. Accordingly, the punishment of piracy has always been extremely severe. It would be no doubt better if a mode were adopted by which it would not be necessary for a nation to be judge in its own cause. A rule does not seem impossible to be framed, according to which the punishment of piracy might be provided for, by referring those accused of it either to some general tribunal constituted for that purpose, or to the tribunals of some nation other than that against which the offence has been perpetrated. A general law on this subject, to be observed by all nations, would be highly desirable.

Rules, therefore, seem not difficult to be laid down for regulating the proceedings of nations on the high seas. A distinction, however, is drawn between what is called the *high*, and what is called the *narrow seas*. By the narrow seas is commonly meant some portion of sea to a greater or less extent immediately surrounding a particular country, and in which that country claims peculiar privileges. The question is, whether any such privileges should be allowed, and, if allowed, to what extent?

The regulating principle in this, as in other cases, is the general advantage, the principle of utility. There are cases in which certain privileges in the waters surrounding a particular country are of so much importance to that country, and the exercise of those advantages occasions so very little inconvenience to other nations, that what is lost by all of them taken together bears no comparison with what is gained by that particular nation. In these cases the exercise of such privileges should be allowed; they should, however, be defined, in as many instances as possible, and promulgated by insertion in an international code.

Of the privileges in question, are all those which are essential, or to a considerable degree subservient, to the national security. In some cases the exclusive right of fishing might perhaps come under the same rule. But this is in general provided for by the necessity of drawing the nets, or curing the fish, upon the land, a privilege which, of course, it is in the power of any nation to give or to withhold.

In obedience to this equitable principle, it appears that such foppish privileges as have sometimes been insisted upon, affording no advantage to one nation which is not wholly at the cost of others (lowering the flag, for example, and such like impositions), should not be recognised by the code of nations.

It appears, also, that those tolls which have been sometimes and are levied at the narrow inlets of some seas, deserve to fall under the same condemnation. The passage through these inlets is a common good to all the nations of the earth which may have a motive to use them, a good of the highest importance to the nations which are situated within, and to which it is the only means of maritime communication; and, while it imparts no evil to the conterminous nation, the toll which that nation levies is an advantage obtained wholly at the cost of others, and imposing upon them a burden, in the way of obstruction and trouble, which is compensated for by advantage to nobody.

The waters, we have said, in respect to which rights should be assigned to nations, are rivers and the sea. Having stated what appears necessary on the present occasion with respect to the sea, it remains that we offer the few observations required on the subject of rivers.

Rivers are either the boundary between two countries, or they are wholly within a particular country.

Those which are wholly within a particular country, it seems most agreeable to the principle of utility to regard as wholly belonging to that country. In the case of navigable rivers which pass through several countries, it would indeed be desirable for those countries which are situated higher up than at the mouth of each, as well as for all those who might thus have intercourse with them, that the navigation of such rivers should be free; but it would be difficult so to regulate this right, as not to affect the security of the country through which a free navigation should thus be allowed; and a slight diminution in its security would be so great a loss to that country as would require, to compensate for it, a very great advantage to those by whom the navigation was enjoyed. Unless where this advantage were very great, it would not, therefore, be agreeable to the principle which should dictate the laws of nations, that the freedom of the navigation should be regulated on any other principles than those of mutual agreement.

In regard to those rivers which flow between two countries, the principle of regulation is sufficiently plain. The benefits derivable from the river should be shared equally between them. Its principal benefits arise from the fishing and from the navigation. The right of fishing in most cases may be fitly distributed, by each party fishing from its own bank to the middle of the stream. The right of navigating of each must be so exercised as not to obstruct the right of the other. In this case the same sort of rules are required to prevent the ships of the two nations from obstructing one another in a common river, as are found available to prevent the ships of different individuals from obstructing one another in a river belonging to one country. There is no difficulty, therefore, here, which it is worth stopping to show how to remove.

IV.—*What should be recognised as Rights in time of War.—What should be regarded as necessary to render the Commencement of a War just.—What should be regarded as just and unjust in the Modes of carrying on a War.*

We have now adduced what our limits admit to be said upon the first great branch of the inquiry relative to the law of nations, namely, the rights which they should recognise in one another in the state of peace. We proceed to the second branch, relating wholly to the state of war.

The questions which present themselves for solution relating to the state of war, are either those which respect its commencement, or those which respect the mode of carrying it on.

With respect to the commencement of a war, the principal question is, What are the conditions which should be regarded as necessary to render it just?

As men, in a situation where laws, and the protection derived from them, do not exist, are left to their own protection, and have no means of deterring other men from injuring them, but making them dread injury in return; so nations, which, with respect to one another, have, as we have seen before, but little protection from the legal sanction, are left to supply its place by this dread of injury in return, which, in the case both of individuals and of nations, may be called the *retributive sanction*, and of which, in the case of nations, war is the principal organ.

From this view of the essence and end of war, we lay down immediatcly one pretty extensive proposition with regard to the conditions necessary to render it just.

As the legal sanction, or punishment for the offences of individuals, ought to operate only where some right has been violated, and the violation has been such as to require it, so the retributive sanction of nations, which is war, ought to operate only where some right of the nation, or something which ought to be traced as a right, has been violated, and where the violation has been such as to require that desperate remedy.

But as not all violations which may possibly be committed of the rights of a nation will justify it in inflicting war, the next object is to draw the line of separation, and distinguish between those violations of the rights of nations which justify, and those which do not justify, the extremity of war.

As the evils which war produces are exceedingly great, it is, first of all, evidcnt, that no violation of rights which is not very great, will, upon the principle which we have so often recognised, suffice to justify it. Of two evils, the least is the choice of all sound legislation.

Of the violation of the rights of individuals in the same country, the cases meet for punishment are capable of being pointed out with a degree of accuracy not wanting much of perfection. Of the violation of the rights of nations committed by one nation against another, the cases which would justify the remedial operation of war are much more difficult to define. The difficulty, indeed, is not universal; for there are cases which may be very satisfactorily defined; and as far as definition can go, it is of the utmost importance that it should be carricd. Uncertainty, then, pervades only one part of the field; which the more we are able to lessen, the greater is the advantage in favour of humanity. If a propcr code of international law were formed, there would be certain defined violations of the rights of nations which would be pointed out, not only as deserving the indignation and hatred of all the world, but as justifying the injured nation before all the world, in inflicting upon its injurer the calamities of war. There would also be certain other injuries pointed out, of a more doubtful character, which might, or might not, according to circumstances not easy to define, be such as to justify recourse to war. The injuries of this secondary character, also, which might, or might not, according to circumstances, justify a war, are capable of being pointed out with a certain degree of accuracy. To a certain degree, likewise, the circumstances which would convert them into justifying causes, are capable of being foreseen. So far definition is capable of extending, and so far, of course, it ought to be carried.

In illustration of this latter class of injuries, we may select the most remarkable, perhaps, and important of all the instances; preparations for a threatened attack. A sense of security is one of the most valuable treasures of a nation; and to be deprived of that sense of security, is onc of the greatest injuries. But what state of preparation shall or shall not be considered as justifying the threatened nation in striking the first blow, in order not to give its enemy the advantage of completing his preparations, and making his attack just at the moment when it would be most destructive, it is perhaps impossible to determine for all cases beforehand; though, no doubt, a certain progress may be made towards that determination, and the bounds of uncertainty may be greatly reduced.

We are aware how general, and therefore how unsatisfactory, these observations are, on the important subject of defining those violations of the rights of nations, which ought to be regarded as justificatory causes of war; but at the same time it is to be observed, that not much more could have been done without framing the code, by actually enumerating and defining the violations for which that remedy should be reserved.

Another consideration is now to be weighed. It is evident, that whatever injuries are done by one nation to another, compensation may almost always bc made for them. It is equally evident, that whatever injury may have been sustained, if compensation is made for it, the justificatory cause of war is removed.

The doctrine of compensation, therefore, is an important part of international jurisprudence. Before recourse is had to war for any violation of rights, compensation ought first to be demanded; and no war, except in cases fit for exception, should be regarded as just, which this demand had not preceded; a demand which should be made through a constituted organ, and in a predetermined modc, as we shall more fully describe in a subsequent page, when we come to treat of an international tribunal.

As there can be no reason why the demand of compensation should not always precede the use of arms, except in cases of such a necessity as will not allow timc for demanding compensation, a necessity for the immediate use of arms, in order to prevent an evil immediately impending, those cases of urgent necessity should, as far as possible, be sought out and defined.

Other circumstances may be enumerated, as belonging to this first stage of the remedy against a nation which places itself in an attitude affecting the sense of security of any of its neighbours. If a nation is making preparations, or cxecuting any other measures calculated to excite alarm, it may be called upon to desist from them; or it may be called upon to give security that it will not make a hostile use of them. Of these securities, hostages are one of the most familiar instances. Various other instances will easily present themselves to the consideration of our readers. Upon this part of the subject, therefore, it is unnecessary for us to enlarge.

It thus appears, that we may lay down, with a considerable degree of precision, the conditions upon which the commencement of a war ought to be regarded as just. It remains, under this head of inquiry, that we show how it may, as far as possible, be determincd, what ought to be regarded as just and unjust in the modes of carrying it on.

This is an inquiry of more complexity, a good deal, than the first. In looking out for a guiding principle, it is evidently necessary to keep in view the end to which every just war is of necessity restricted. That is, compensation for an injury received, and security that a fresh injury shall not be committed. Combining this with the grand principle of humanity and utility, in other words, of morality; namely, that all evil, wilfully occasioned, and not calculated to produce a more than equivalent good, is wickcd, and to be opposed, we obtain one comprehensive and highly important rule; which is this: That in the modes of carrying on war, everything should be condemned by the law of nations, which, without being more conducive, or more in any considerable degree to the attainment of the just end of the war, is much more mischievous to the nation against whom it is done.

As the end is to be gained, in most cases, only by inflicting a loss of men and property upon the opposing nation, it would be desirable that the distinction should be drawn between the modes of inflicting this loss, which are the most, and those which are the least, calculated to inflict pain and suffering, without being more conducive to the end.

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One distinction is sufficiently remarkable; namely, the distinction between the men who are in arms, or actually opposed to the designs of the belligerent, and the men who are not so; also between the property which belongs to the government of the opposing nation, and that which belongs to private individuals composing the nation.

With respect to the first class of objects, the men in arms, and the property of the government, there is not much difficulty. To produce the loss of them, as rapidly as possible, till the end or purpose of the war is obtained, appears to be a privilege which cannot be separated from the right of warring at all.

With respect to the loss of men, indeed, there is an important restriction. It means the loss of them for the purposes of the war, and no more. If it be practicable to put them in a situation in which they can no longer be of any service to the war, all farther injury to them should be held unjustifiable. Under this rule falls the obligation so generally recognised of making our enemies, as often as possible, prisoners, instead of killing them, and of treating them with humanity while retained in that condition.

That part of the subject, therefore, which relates to men in arms, and to such property as belongs immediately to the government, it is not impossible to include in rules of tolerable precision. The difficulty is with respect to those individuals who, composing the body of the nation, form no part of the men in arms, and with respect to the property of such individuals.

Though it would not be correct to say, that these do not contribute, or rather that they may not be made to contribute, to the means with which the government carries on the war; yet it would be absurd not to recognise a very broad distinction between them and the men and things which are immediately applied, or applicable to the war. A difference, therefore, equally broad, ought, in reason, to be made in the mode of treating them. The mode of treating the one ought to be very different from that of treating the other. As the rule of destruction must be the rule with regard to the first, only limited by certain restrictions; so the rule of forbearance and preservation ought to be the rule with regard to the latter, only to be infringed upon special and justifying circumstances.

Thus far we seem to have travelled with the advantage of light to our path. We may go a little farther with equal certainty, and say, that, as far as regards the persons of those who are not engaged in the immediate business of hostility, very few occasions can occur, in which it would be allowable, upon any just principle of international law, to do them any injury. Leaving them out of the question, we narrow it to the case of the property belonging to individuals; and shall now proceed to see how far the protection of it can be embraced within general rules.

We must suppose the case which is the strongest, that of an invading army. The advantage which is capable of being derived to such an enemy, by seizing and destroying the property of individuals, bears, unless in certain very extraordinary instances, no sort of proportion to the evil inflicted upon the individuals. This, we presume, cannot admit of a dispute. Upon the principle, therefore, so often recognised, as dictating the rules which ought in this affair to be solely obeyed, no such destruction, unless in such instances, ought to be sanctioned by the law of nations. Such property, it is well known, can rarely be counted upon as any considerable resource; because it is to a very great extent in the power of the people invaded to drive their property away, or to destroy it. The property of individuals in an invaded country would in general be a much more certain resource to an invading army, if that army were to purchase from them the articles it desired. And, perhaps, this would be the most advantageous compromise of which the circumstances admit; namely, that the invading army should abstain from the violation of private property, but that it should in return have the benefit of an unrestricted market; that nothing should be done on the part of the government of the invaded country to prevent its subjects from buying and selling with the invaders, as they would with any other parties.

It may no doubt be true, that the plunder and devastation of a province, or other portion of a country, must have an effect in diminishing the resources of the government for carrying on the war. In this point of view, it must be allowed that the destruction of private property is of some importance to the invading nation with regard to the result of the war. But the question, in settling the difficulties of international jurisprudence, is not whether an advantage is gained, but whether the advantage, such as it is, be not gained at too great a cost.

If it be certain that the losing party, in consequence of the destruction in question, loses more than the gaining party gains, it is certain that the two parties, taken together, are losers by the proceeding; and of course that nations, in the aggregate, are losers upon the whole. Nay, it is certain that each nation, taken by itself, is a loser, upon the balance of the cases in which it is liable to lose, and those in which it is liable to gain. If it loses more in the cases in which it bears, than it gains in the cases in which it inflicts invasion, and if it is as liable to bear as to inflict, which is the usual condition of nations, it follows clearly that it is its interest to concur in a rule which shall protect the property of individuals in cases of invasion.

Even in that more civilized mode which has been adopted by invading armies, of availing themselves of the property of individuals, by exacting contributions through the instrumentality of the local authorities; contributions which these authorities are left to partition among the people, as they may deem equitable; though it is admitted that this is a much less hurtful proceeding than military rapine, still we think it will easily appear, that the evil inflicted upon the contributors is greater than the benefits derived to the receivers.

Unless the amount thus received by an invading army is very considerable, the benefit which is derived, the aid which is gained towards accomplishing the end of the war, must be considered as trifling. But if a contribution, the amount of which can be of any considerable avail towards attaining the object of the war, is levied suddenly upon a particular district, a comparatively small portion of the invaded country, it must operate upon the contributors with a dreadful weight of oppression. Upon an equal estimate of the circumstances, it can, therefore, hardly fail to appear that, whether the contribution exacted is heavy or light (it must always be heavy to those who sustain it), the loss to those who suffer must greatly outweigh the advantage to those who receive. If it be so, this mode of exaction should, it is evident, be forbidden by the law of nations.

If these are the principles upon which an international code, regarding this branch of the subject, ought to be constructed, they will enable us to determine the question with regard to the property of individuals in another set of circumstances, to which the rules of civilized society have hardly yet begun to be applied. Whatever rules apply to the property of individuals found upon the land, the same rules ought, by parity of reason, it should seem, to apply to it when found upon the sea.

The conduct of nations, however, has hitherto not been conformable to the parity which appears to belong to the two sets of cases. Some tenderness, more or less, according to the progress of civilization, appears to have been shown, by all but savages, to the property of individuals upon the land. To this hour the property of individuals upon the sea is made prize of without mercy, by the most civilized nations in the world.

The notions of piracy, in fact, have, on this subject, unhappily prevailed, and governed the minds of men. Pirates make prey of everything. Sailors, originally, were all pirates. The seafaring state was a belligerent state, of almost every vessel against every other vessel. Even when nations had gradually advanced into a more civilized state, and when their vessels abstained from injury to one another in a period of peace, they appear, when the ties of peace were dissolved, and they were placed with respect to one another in a state of war upon the seas, to have felt the force of none but their old associations, and to have looked upon the state of war as a state of piracy. Two nations at war with one another continue to act towards the property of individuals belonging to one another at sea, exactly as two nations of pirates would do.

Assuredly this is a state of things to which the present intelligence and morality of the world ought speedily to put an end. The very same reasoning which we have applied to the case of the property of individuals upon the land, is not less conclusive when applied to the property of individuals upon the sea. The loss to the party losing is more than an equivalent for the gain to the party that gains.

There is another consideration of great importance. All nations gain by the free operations of commerce. If, then, we were to suppose that the losses and gains of the two belligerent parties balanced one another, which yet they never do, there is an advantage derived from their commerce to every nation on the earth to which, in any degree, either directly or indirectly, that commerce extends; which advantage is either lost or diminished, by their preying upon the property of the individuals belonging to one another. This, therefore, is an unquestionable balance of loss to the general community of nations, which the law of that community ought to endeavour to prevent.

If, then, we should suppose that it were enacted as the law of nations, that the property of individuals passing on the seas should be equally respected in peace and in war, we may proceed to consider whether any disadvantage, nearly countervailing the general good, would thence accrue to the belligerents.

It may be alleged, that a nation at war with another is retarded in reducing its antagonist, by the riches which the commerce of that antagonist, if undisturbed, will place at its disposal. But it is evident that an advantage to one of two antagonists, when compensated to the other, by a power to overcome that advantage, exactly equivalent, is in reality no advantage at all. Such is the case with the advantage accruing to the nation with which another is at war, when the property of individuals upon the sea is allowed to pass unmolested. If its riches are increased by freedom of commerce, so are those of its antagonist. The advantages are equal where the circumstances are equal, which, in the majority of cases, they undoubtedly are.

If it be still objected, that there may be cases in which they are not equal, the answer is obvious and incontrovertible. There is no general rule without its exceptions, but partial evil must be admitted for general good. Besides, if the case were very remarkable, it might be excepted from the general rule.

If this were adopted as part of the law of nations, all those questions respecting the maritime traffic of *neutrals*, questions which have been the source of so much troublesome inquiry, so much animosity, and so much mischief, would be immediately at an end. If the traffic of the belligerents, so far as concerned the property of individuals, were free, so would be that of all neutral nations.

Places actually blockaded, that is, surrounded with an hostile force for the immediate purpose of being reduced, either by arms or by famine, would still form exceptions; because the admission of ships into them with supplies, either of food or munition of war, would be directly at variance with the very object of the blockade.

In all other cases, the admission either of provisions or of instruments of war into a belligerent country ought, undoubtedly, upon the principle of utility, not to be disturbed. The benefit, except in rare and remarkable cases, could not be material to the country into which they might enter, nor hence the injury to its antagonist; on the other hand, that antagonist would enjoy the same privilege of the free admission of those commodities, and thus they would be equal in all respects. The inconvenience, however, which would thus be saved to the neutrals—the annoyance of search, the loss by detention, the occasions of quarrel—are known to be evils of no ordinary magnitude.

The desertion of sailors from the ships of a belligerent to those of a neutral has given rise to disputes in one instance only, that of Great Britain and the United States of America. The question to be determined, in laying down the principles of international jurisprudence, is, whether this desertion ought to be considered as constituting a ground for the general right of search; in other words, whether the evil to which a belligerent is exposed by desertion, or rather by that portion of desertion which can be prevented by the right of search, is an equivalent for all the evil which is unavoidably produced by it.

Desertion must take place either from the ships of war of the belligerent, or from its merchant ships.

In respect to ships of war, it is so easy for a belligerent to prevent desertion to neutrals, at least in any such degree as to constitute a great evil, that it would be altogether absurd to speak of it as fit to be compared with the evils arising from the right of search. The only occasions on which ships of war can be exposed to desertion to neutrals, must be those on which they go into a neutral port. But on those comparatively rare occasions, they can so easily take precaution against desertion, that the danger to which they are exposed is hardly worth regarding.

When the sailors belonging to merchant ships transfer their services to the ships of a neutral, it is not to be called desertion. It can only take place in very considerable numbers when seamen's wages in the neutral country are much higher than in the belligerent. The sailor, in this case, leaves his own for another country, only because he improves his situation by so doing. This is a liberty which, as it ought to belong to every body, so it ought not to be withheld from the sailor. If, indeed, any nation thinks proper to forbid any class of its people to leave their country, as England with regard to its artificers, other countries cannot help that; but they ought not to be called upon to lend their aid to such an antisocial regulation, by allowing their vessels to be searched, as security against its infringement. Besides, it is evident that there is a much greater security, arising from the very nature of the case, against the chance of a nation's being, to any considerable degree, deprived of its sailors by any such means. If the sailors go into the neutral country because wages are higher there, a small number only will have gone, when wages, from diminution of the numbers, will begin to rise in the country which they have left, and, from increase of the numbers, will begin to fall in the country to which they have been tempted to repair. When the wages of seamen have thus sufficiently risen in the belligerent country, which they are sure to do if the demand for them rises, the sailors will not only come back from every country in the world, but the sailors of other countries will hurry along with them; and the evil of desertion cures itself.

Only two questions of any great importance appear to remain; that relating to the march of troops, for a hostile purpose, through a neutral country, and that relating to the extent to which the operations of a successful war ought to be pursued.

According to the principles which we have already laid down for regulating the proceedings of a hostile army even in the invaded country, namely, that of committing no plunder, and enjoying the right of market, it appears that the right of passing through a neutral country on similar terms should be refused to no party. This rule, while it holds out equal advantages to all belligerents, admits, less than any other rule, grounds of dispute.

The end, which we have already described as that alone the pursuit of which can render any war justifiable, sufficiently defines the extent to which the operations of a successful war ought to proceed. The end of every justifiable war is to obtain compensation for an injury sustained, and security against the repetition of it. The last point, that of security, alone admits any uncertainty. Nations are apt to exaggerate the demand for security; to require too much; very often unconsciously, from the mere cravings of self-love; sometimes fraudulently, as a cover for ambitious views. As the question, however, respecting what may or may not, in each instance, be sufficient security, is a question of fact, not of law, it must be determined, if determined at all, by a tribunal empowered to take cognizance of the facts.

V.—*Of the Construction of an International Code, and an Internationl Tribunal.—How the Nations might concur in framing an International Code.—How an International Tribunal should be constructed.—Form of Procedure before the International Tribunal.*

We have now, then, laid down the principles by which, in our opinion, the rights of nations, in respect to one another, ought to be determined; and we have shown in what manner those principles should be applied, in order to come to a decision in the most remarkable cases. The minor points it is, of course, not in our power to illustrate in detail; but that will not, we should hope, be difficult, after the exemplification exhibited, and the satisfactory solutions at which we seem to have arrived, of all the more considerable questions which the subject presents.

From what has been shown, it is not difficult to see what would be the course pursued by nations, if they were really actuated by the desire of regulating their general intercourse, both in peace and war, on the principles most advantageous to them all.

Two grand practical measures are obviously not only of primary importance toward the attainment of this end, but are of indispensable necessity toward the attainment of it in any tolerable degree. These are, first, the construction of a code; and, secondly, the establishment of a tribunal.

It is perfectly evident, that nations will be much more likely to conform to the principles of intercourse which are best for all, if they have an accurate set of rules to go by, than if they have not. In the first place, there is less room for mistake; in the next, there is less room for plausible pretexts; and, last of all, the approbation and disapprobation of the world is sure to act with tenfold concentration, where a precise rule is broken, familiar to all the civilized world, and venerated by all.

How the nations of the civilized world might concur in the framing of such a code, it is not difficult to devise. They might appoint delegates to meet for that purpose in any central and convenient place, where, after discussion, and coming to as full an undertaking as possible upon all the material points, they might elect some one person, the most capable that could be found, to put these their determinations into the proper words and form; in short, to make a draught of a code of international law, as effectually as possible providing for all the questions which could arise, upon their interfering interests, between two nations. After this draught was proposed, it should be revised by the delegates, and approved by them, or altered till they deemed it worthy of their approbation. It should then be referred to the several governments, to receive its final sanction from their approbation; but, in the mean time, it should be published in all the principal languages, and circulated as extensively as possible, for the sake of two important advantages. The first would be, that, the intelligence of the whole world being brought to operate upon it, and suggestions obtained from every quarter, it might be made as perfect as possible. The second would be, that the eyes of all the world being fixed upon the decision of every nation with respect to the code, every nation might be deterred by shame from objecting to any important article in it.

As the sanction of general opinion is that upon which chiefly, as we have already seen, such a code must rely for its efficiency, not a little will depend upon the mode in which it is recognised and taught. The recognition should in each country have all possible publicity and solemnity. Every circumstance which can tend to diffuse the opinion throughout the earth, that the people of each country attach the highest importance to such a code, is to themselves a first-rate advantage; because it must be of the utmost importance to them, that all the nations of the earth should behave towards them upon the principles of mutual beneficence; and nothing which they can do can have so great a tendency to produce this desirable effect, as its being generally known that they venerate the rules which are established for its attainment.

If nations, then, were really actuated by the desire of regulating their mutual intercourse upon principles mutually beneficent, they would adopt measures for having a code of international law constructed, solemnly recognised, and universally diffused and made known.

But it is not enough that a code should exist: every thing should be done to secure a conduct conformable to it. Nothing is of so much importance for this purpose as a tribunal; before which every case of infringement should be tried, the facts of it fully and completely explored, the nature and degree of the infringement ascertained; and from which a knowledge of every thing material to the case should be as rapidly as possible diffused through the world; before which also all cases of doubt should regularly come for determination: and thus wars, between nations which meant justly, would always be avoided, and a stigma would be set upon those which justice could not content.

The analogy of the code, which is, or ought to be, framed by each state for regulating the intercourse of its own people within its own territory, throws all the illustration which is necessary upon the case of a tribunal for the international code. It is well known, that laws, however carefully and accurately constructed, would be of little avail in any country, if there was not some organ, by means of which it might be determined when individuals had acted in conformity with them, and when they had not; by which also, when any doubt existed respecting the conduct which in any particular case the law required, such doubt might be authoritatively removed, and one determinate line of action prescribed. Without this, it is sufficiently evident that a small portion of the benefit capable of being derived from laws would actually be attained. It will presently be seen how much of the benefit capable of being derived from an international code must be lost, if it is left destitute of a similar organ. We shall first consider in what manner an international tribunal might be constructed; and, next, in what manner it might be appointed to act.

As it is understood that questions relating to all nations should come before it, what is desirable is, that all nations should have equal security for good judicature from it, and should look with equal confidence to its decisions.

An obvious expedient for this purpose is, that all nations should contribute equally to its formation; that each, for example, should send to it a delegate or judge. Its situation should be chosen for its accessibility, and for the means of publicity which it might afford; the last being, beyond comparison, the advantage of greatest importance. As all nations could not easily, or would not, send, it would suffice if the more civilized and leading nations of the world concurred in the design, with such a number of the less considerable as would be sure to follow their example, and would be desirous of deriving advantage from an instrument of protection, which to them would be of peculiar importance.

As it is found by specific experience, and is, indeed, a consequence of the ascertained laws of human nature, that a numerous assembly of men cannot form a good judicatory; and that the best chance for good judicial service is always obtained when only one man judges, under the vigilant eyes of interested and intelligent observers, having full freedom to deliver to the world their sentiments respecting his conduct; the whole of these advantages may be obtained, in this case, by a very effectual expedient. If precedent, also, be wanted, a thing which in certain minds holds the place of reason, it is amply furnished by the Roman law; according to which, a great number of judges having been chosen for the judicial business generally of the year, a selection was made out of that number, according to certain rules, for each particular case.

Every possible advantage, it appears, would be combined in the international tribunal, if the whole body of delegates or judges, assembled from every country, should, as often as any case for decision came before them, hold a conference, and, after mature deliberation, choose some one individual of their body, upon whom the whole duty of judge should, in that case, devolve; it being the strict duty of the rest to be present during the whole of his proceedings, and each of them to record separately his opinion upon the case, after the decision of the acting judge had been pronounced.

It would be, no doubt, a good general rule, though one can easily foresee cases in which it would be expedient to admit exceptions, that the judge, who is in this manner chosen for each instance of the judicial service, should not be the delegate from any of the countries immediately involved in the dispute. The motive to this is sufficiently apparent.

We apprehend, that few words will be deemed necessary to show how many securities are thus provided for the excellence of the judicial service.

In the first place, it seems impossible to question, that the utmost fairness and impartiality are provided for in the choice of the judge; because, of the two parties involved in the dispute, the one is represented by a delegate as much as the other, and the rest of the delegates are indifferent between them. In general, therefore, it is evident, that the sinister interest on the two sides being balanced, and there being a great preponderance of interest in favour of nothing but a just decision, that interest will prevail.

The best choice being made of a judge, it is evident that he would be so situated as to act under the strongest securities for good conduct. Acting singly, he would bear the whole responsibility of the service required at his hands. He would act under the eyes of the rest of the assembled delegates, men versed in the same species of business, chosen on account of their capacity for the service, who could be deceived neither with respect to the diligence which he might exert, nor the fairness and honesty with which he might decide; while he would be watched by the delegates of the respective parties, having the power of interest stimulating them to attention; and would be sure that the merits or demerits of his conduct would be made fully known to the whole, or the greater part of the world.

The judicatory being thus constituted, the mode of proceeding before it may be easily sketched.

The cases may be divided into those brought before it by the parties concerned in the dispute, and those which it would be its duty to take up when they were not brought before it by any of the parties.

A variety of cases would occur, in which two nations, having a ground of dispute, and being unable to agree, would unite in an application to the international tribunal for an adjustment of their differences. On such occasions, the course of the tribunal would be sufficiently clear. The parties would plead the grounds of their several claims; the judge would determine how far, according to the law, they were competent to support those claims; the parties would adduce their evidence for and against the facts on which the determination of the claims was found to depend; the judge would receive that evidence, and finally decide. All this is so perfectly conformable to the course of pleading, and receiving proof, in the case of suits between individuals, as analysed and explained in the article JURISPRUDENCE, that it is unnecessary to be more particular here. If further exposition is required, it will be found upon a reference to the article to which we allude. Decision, in this case, it is observable, fully accomplishes its end; because the parties come with an intention of obeying it.

Another, and a numerous class of cases, would probably be constituted, by those who would come before it, complaining of a violation of their rights by another nation, and calling for redress.

This set of cases is analogous to that, in private judicature, when one man prosecutes another for some punishable offence.

It should be incumbent upon the party thus applying to give notice of its intention to the party against which it is to complain, and of the day on which it means that its complaint should be presented.

If both parties are present when the case comes forward for trial, they both plead, according to the mode described in the article JURISPRUDENCE; evidence is taken upon the decisive facts; and if injury has been committed, the amount of compensation is decreed. When it happens that the defendant is not present, and refuses to plead, or to submit, in this instance, to the jurisdiction of the court, the inquiry should notwithstanding go on; the allegations of the party present should be heard, and the evidence which it adduces should be received. The non-appearance of the party defendant should be treated as an article of evidence to prove the truth of its opponent's allegations. And the fact of not appearing should itself be treated as an offence against the law of nations.

It happens, not unfrequently, when nations quarrel, that both parties are in the wrong; and on some of these occasions neither party might think proper to apply to an equitable tribunal. This fact, namely, that of their not applying to the international tribunal, should itself, as stated before, be marked in the code as an international offence, and should be denounced as such by the international tribunal. But even when two offending parties do not ask for a decision from the international tribunal, it is not proper that other nations should be deprived of the benefit of such a decision. If these decisions constitute a security against injustice from one another to the general community of nations, that security must not be allowed to be impaired by the refractory conduct of those who dread an investigation of their conduct.

Certain forms, not difficult to devise, should be laid down, according to which, on the occurrence of such cases, the tribunal should proceed. First of all, it is evident that the parties in question should receive intimation of the intention of the court to take cognizance of their disputes on a certain day. If the parties, one or both, appeared, the case would fall under one of those which have been previously as above considered. If neither party appeared, the court would proceed to estimate the facts which were within its cognizance.

It would have before it one important article of evidence, furnished by the parties themselves, namely, the fact of their non-appearance. This ought to be considered as going far to prove injurious conduct on both sides. The evidence which the court would have before it, to many specific facts, would be liable to be scanty, from the neglect of the parties to adduce their pleas and evidence. The business of the court, in these circumstances, would be, to state correctly such evidence, direct or circumstantial, as it had before it; giving its full weight to the evidence contained in the fact of non-appearance; and to pronounce the decision which the balance of the evidence, such as it was, might be found to support.

Even in this case, in which the practical effect of a decision of the international court may be supposed to be the least, where neither party is disposed to respect the jurisdiction, the benefit which would be derived would by no means be inconsiderable. A decision solemnly pronounced by such a tribunal would always have a strong effect upon the imaginations of men. It would fix and concentrate the disapprobation of mankind.

Such a tribunal would operate as a great school of political morality. By sifting the circumstances in all the disputes of nations, by distinguishing accurately between the false colours and the true, by stripping off all disguises, by getting at the real facts, and exhibiting them in the true point of view, by presenting all this to the world, and fixing the attention of mankind upon it by all the celebrity of its elevated situation, it would teach men at large to distinguish. By habit of contemplating the approbation of such a court attached to just proceeding, its disapprobation to unjust, men would learn to apply correctly their own approbation and disapprobation; whence would flow the various important effects which those sentiments, justly excited, would naturally and unavoidably produce.

As, for the reasons adduced at the beginning of this article, the intention should never be entertained of supporting the decisions of the international court by force of arms, it remains to be considered what means of another kind could be had recourse to in order to raise to as high a pitch as possible the motive of nations respectively to yield obedience to its decisions.

We have already spoken of the effect which would be produced, in pointing the sentiments of mankind, and giving strength to the moral sanction, by the existence of an accurate code, and the decisions themselves of a well-constituted tribunal.

To increase this effect to the utmost, publicity should be carried to the highest practicable perfection. The code, of course, ought to be universally promulgated and known. Not only that, but the best means should be in full operation for diffusing a knowledge of the proceedings of the tribunal; a knowledge of the cases investigated, the allegations made, the evidence adduced, the sentence pronounced, and the reasons upon which it is grounded.

The book of the law of nations, and selections from the book of the trials before the international tribunal, should form a subject of study in every school, and a knowledge of them a necessary part of every man's education. In this manner a moral sentiment would grow up, which would, in time, act as a powerful restraining force upon the injustice of nations, and give a wonderful efficacy to the international jurisdiction. No nation would like to be the object of the contempt and hatred of all other nations; to be spoken of by them on all occasions with disgust and indignation. On the other hand, there is no nation which does not value highly the favourable sentiments of other nations; which is not elevated and delighted with the knowledge that its justice, generosity, and magnanimity, are the theme of general applause. When means are taken to make it certain, that what affords a nation this high satisfaction will follow a just and beneficial course of conduct, that what it regards with so much aversion will infallibly happen to it if it fails in the propriety of its own behaviour, we may be sure that a strong security is gained for a good intercourse among nations.

Besides this, it does not seem impossible to find various inconveniences, to which, by way of penalties, those nations might be subjected, which refused to conform to the prescriptions of the international code.

Various privileges granted to other nations, in their intercourse with one another, might be withheld from that nation which thus demeaned itself in a way so contrary to the general interests. In so far as the withholding of these privileges might operate unfavourably upon individuals belonging to the refractory nations, individuals who might be little, or not at all, accessory to the guilt, the effect would be the subject of proportional regret. Many, however, in the concerns of mankind, are the good things which can only be attained with a certain accompaniment of evil. The rule of wisdom, in such cases, is, to make sure that the good outweighs the evil, and to reduce the evil to its narrowest dimensions.

We may take an instance first from trivial matters. The ceremonial of other nations might be turned against the nation, which, in this common concern, set itself in opposition to the interests of others. The lowest place in company, the least respectful situation on all occasions of ceremony, might be assigned to the members of that nation, when travelling or residing in other countries. Many of those marks of disrespect, implying injury neither to person nor property, which are checked by penalties in respect to others, might be free from penalties in respect to them. From these instances, adduced merely to illustrate our meaning, it will be easy to see in what manner a number of considerable inconveniences might, from this source, be made to bear upon nations refusing to conform to the beneficial provisions of the international code.

Besides the ceremonial of other nations, means to the same end might be derived from the law. A number of cases might be found in which certain benefits of the law, granted to other foreigners, might be refused to them. They might be denied the privilege of suing in the courts, for example, on account of any thing except some of the higher crimes, the more serious violations of person or property.

Among other things, it is sufficiently evident that this tribunal would be the proper organ for the trial of piracy. When preponderant inconvenience might attend the removing of the trial to the usual seat of the tribunal, it might delegate for that purpose the proper functionaries to the proper spot.

By the application of the principles which we have thus expounded, an application which implies no peculiar difficulty, and requires nothing more than care in the detail, we are satisfied that all might be done, which is capable of being done, toward securing the benefits of international law. (A. A. A.)

Law-Language. In England all law proceedings, as indeed public proceedings of all kinds, were formerly conducted in Norman-French, and even the arguments of the counsel and decisions of the court were delivered in the same barbarous dialect; an evident and shameful badge of tyranny and foreign servitude, having been introduced under the auspices of William the Norman and his sons, and by which the sneer of the Roman satirist was once more verified, *Gallia causidicos docuit facunda Britannos.* This continued till the reign of Edward III. who, having employed his arms successfully in subduing the kingdom of France, thought it unbecoming the dignity of the victors to use any longer the language of a vanquished country. By a statute passed in the thirty-sixth year of his reign, it was therefore enacted, that for the future all pleas should be pleaded, shown, defended, answered, debated, and judged, in the English tongue, but should be entered and enrolled in Latin; in the same manner as Don Alonso X. king of Castile, the great-grandfather of our Edward III., obliged his subjects to use the Castilian tongue in all legal proceedings, and as, in the year 1286, the German language was established in the courts of the empire. And if our legislature had then directed that the writs themselves, which are mandates from the king to his subjects, enjoining them to perform certain acts, or to appear at certain places, should be framed in the English language, according to the rule of our ancient law, it would have been a still further improvement. But the record or enrolment of these writs, and the proceedings thereon, being calculated for the benefit of posterity, was more serviceable, because more durable, in a dead and immutable language than in a living and fluctuating one. The practitioners, however, being used to the Norman language, and therefore imagining that they could express their thoughts more aptly and more concisely in that than in any other, still continued to take their notes in Norman-French; and when those notes came to be published, under the denomination of *reports*, they were of course printed in that barbarous dialect, which, joined to the additional terrors of a Gothic black letter, has occasioned many a student to throw away his Plowden and Littleton, without venturing to attack a page of them. Yet, upon a nearer acquaintance, they would in reality have found nothing very formidable in the language, which differs in its grammar and orthography as much from the modern French, as the diction of Chaucer and Gower differs from that of Pope and Addison. Besides, as the English and Norman languages were concurrently used by our ancestors for several centuries together, the two idioms naturally assimilated by a reciprocal interchange; and for this reason the grammatical construction of each is so much the same, that an Englishman, with a week's preparation, could understand the laws of Normandy, collected in their *Grand Coustumier*, as well as, if not better than, a Frenchman bred within the walls of Paris.

The Latin, which succeeded the French for the entry and enrolment of pleas, and which continued in use for four centuries, answers so nearly to the English, that it is not at all surprising that it should generally be imagined to have been totally fabricated at home, with little more art or trouble than by adding Roman terminations to English words. But in reality it was an universal dialect, spread throughout all Europe, at the irruption of the northern nations, and accommodated and moulded to the purposes of lawyers with peculiar exactness and precision. This is principally owing to the simplicity, or, it may be, the poverty and baldness of its texture, being calculated to express the ideas of mankind just as they arise in the human mind, without any rhetorical flourishes or perplexed ornaments of style. For it may be observed that those laws and ordinances are generally the most easily understood, in compiling which, strength and perspicuity, not harmony or elegance of expression, have been principally consulted. These northern nations, or rather their legislators, though they resolved to make use of the Latin tongue in promulgating their laws, as being more durable and more generally known than their own Teutonic dialects, yet, either through choice or necessity, they frequently intermixed therein some words of Gothic origin; a circumstance which is more or less the case in every country of Europe, and therefore not to be imputed as any peculiar blemish in English legal latinity. The truth is, that what is generally denominated Law-Latin is in reality a mere technical language, calculated for eternal duration, easy to be apprehended both in present and future times, and on these accounts best suited to preserve the memorials which are intended for perpetual rules of action. The rude pyramids of Egypt have endured from the earliest ages, whilst the more modern and elegant structures of Attica, Rome, and Palmyra, have sunk beneath the wasting influence of time.

As to the objection of locking up the law in a strange and unknown tongue, this is of little weight with regard to records, which few have occasion to read, but such as either do or ought to understand the rudiments of Latin. And besides, it may be observed of the Law-Latin, as Sir John Davis observes of the Law-French, " that it is so very easy to be learned, that the meanest wit that ever came to the study of the law doth come to understand it almost perfectly in ten days without a reader."

It is true, indeed, that the many terms of art with which the law abounds are sufficiently harsh when latinized, and, as Mr Selden observes, may give offence " to some grammarians of squeamish stomachs, who would rather choose to live in ignorance of things the most useful and important, than to have their delicate ears wounded by the use of a word unknown to Cicero, Sallust, or the other writers of the Augustan age." Yet this is only what must unavoidably happen when things of modern use, of which the Romans had no idea, and consequently no phrases to express them, come to be delivered in the Latin tongue. It would puzzle the most classical scholar to find an appellation, in pure latinity, for a constable, a record, or a deed of feoffment; and it is therefore to be imputed as much to necessity as ignorance, that they were styled in our forensic dialect, *constabularius, recordum,* and *feoffamentum.* Thus, again, another uncouth word of our ancient laws, the substantive *murdrum,* or the verb *murdrare,* however harsh and unclassical it may sound, was necessarily framed to express a particular offence, since no other word in being, *occidere, interficere, necare,* or the like, was sufficient to express the intention of the criminal, or *quo animo* the act was perpetrated, and therefore by no means came up to the notion of murder at present entertained by law, viz. killing or slaying with malice aforethought.

A similar necessity produced a similar effect at Byzantium when the Roman laws were converted into Greek for the use of the oriental empire; for, without any regard to Attic elegance, the lawyers of the imperial courts made no scruple to translate *fidei commissarios,* φιδει κομμισσαϱιους; *cubiculum,* κουβουκλειον; *filium-familias,* παιδα-φαμιλιας; *repudium,* ϱεπουδιον; *compromissum,* κομπϱομισσον; *reverentia et obsequium,* ϱευεϱεντια και οβσεκουιον; and so in many other instances. They studied more the exact and precise import of the words, than the neatness and delicacy of their cadence. And it may be suggested, that the terms of the law are not more numerous, more uncouth, or more difficult to be explained by a teacher, than those of logic, physics, and the whole circle of Aristotle's philosophy, nay, even of the more polite art of architecture and its kindred studies, or the science of rhetoric itself. Sir Thomas More's famous legal question contains in it nothing more difficult than the definition which in his time the philosophers currently gave of their *materia prima*, the groundwork of all natural knowledge, that it is "neque quid, neque quantum, neque quale, neque aliquid eorum quibus ens determinatur;" or than the subsequent explanation given by Adrian Heereboard, who assures us that "materia prima non est corpus, neque per formam corporeitatis, neque per simplicem essentiam: est tamen ens, et quidem substantia, licet incompleta; habetque actum ex se entitativum, et simul est potentia subjectiva." The law, therefore, with regard to its technical phrases, stands upon much the same footing with other studies, and requires only the same indulgence.

This technical Latin continued in use from the time of its first introduction till the subversion of the ancient constitution under Cromwell, when, amongst many other innovations, the language of our records was altered and converted into English. But at the restoration of Charles II. this novelty was no longer countenanced, the practitioners finding it very difficult to express themselves concisely or significantly in any other language than the Latin. And thus it continued without any sensible inconvenience until about the year 1730, when it was again thought proper that all proceedings at law should be in English, and it was accordingly so ordered by statute 4 Geo. II. c. 26. This was done in order that the common people might have knowledge and understanding of what was alleged or done for and against them in the process and pleadings, the judgment and entries in cause. It is doubtful how far this has answered the purpose; for there is reason to suspect that the people are now, after many years' experience, altogether as ignorant in matters of law as before. On the other hand, certain inconveniences have already arisen from the alteration. Many clerks and attorneys are now hardly able to read, much less to understand, a record even of so modern a date as the reign of George I. It has also enhanced the expense of all legal proceedings. For, since the practitioners are confined to write only a stated number of words in a sheet, and as the English language, through the multitude of its particles, is much more verbose than the Latin, it follows that the number of sheets must be greatly augmented by the change. The translation also of technical phrases, and the names of writs and other process, were found to be so very ridiculous (a writ of *nisi prius*, *quare impedit*, *fieri facias*, *habeas corpus*, and the rest, not being capable of an English dress with any degree of seriousness), that in two years it was found necessary to make a new act, 6 Geo. II. c. 14, which allows all technical words to continue in the usual language, and has thereby defeated every beneficial purpose of the former statute.

LAW, JOHN, commonly known by the name of the Projector, was the eldest son of William Law, and was born at Edinburgh in the month of April 1671. His father followed the profession of goldsmith or banker, with so much success, that he was enabled to purchase the lands of Lauriston and Randleston, which afterwards descended to his son. The latter was educated at Edinburgh, where he is said to have made some progress in literature; but the bent of his genius having led him to study arithmetic and geometry, he attained such proficiency in these branches, as to be able to solve with facility the most intricate problems; and he likewise made himself master of algebra. The principles of public and private credit, the state of trade and of manufactures, the theory and practice of taxation, and other matters connected with political economy, also engaged his attention; and the accession of knowledge resulting from these inquiries laid the foundation of his future eminence. But he soon became noted as a man of pleasure as well as of study. Having lost his father before he had completed his fourteenth year, he was thus left at an early age without paternal control; and as the graces of a naturally handsome person were improved by the acquisition of external accomplishments, Jessamy John, or Beau Law, as he was indifferently called by his companions, addicted himself to the practice of all games of chance, skill, and dexterity, and appears to have engaged in other pursuits of a still more questionable character. In 1694, he visited London, where his wit and accomplishments procured him admission into the first circles, whilst his extravagance speedily involved him in difficulties. At this time he was noted for his propensity to deep play, and for his gallantries amongst women. By the former, he injured his fortune; in consequence of the latter, he narrowly escaped an ignominious end. An intrigue which he had with a Mrs Lawrence proved the occasion of a quarrel between him and one Mr Edward Wilson; a hostile meeting ensued, and Mr Law killed his antagonist on the spot. He was immediately apprehended, and brought to trial at the Old Bailey, on a charge of murder; and being found guilty, received sentence of death. Upon a representation of the case to the crown, however, Law obtained a pardon; but an appeal being lodged by a brother of the deceased, he was detained in the King's Bench prison. This appeal was brought before the court of King's Bench in Trinity-term 1694; and as the exceptions taken on the part of Law were overruled by the court, the latter, judging it prudent not to await the result, found means to escape from prison,[1] and retired to the Continent.

During his stay abroad, he acted for some time as secretary to the British resident in Holland, and occupied himself in improving his knowledge of financial operations, and particularly in making himself acquainted with the constitution and practical operation of the bank of Amsterdam. He returned to his native country in 1700, and in that year appears to have written his *Proposals and Reasons for Establishing a Council of Trade*, which was published at Edinburgh early in 1701. His project met with no encouragement; but the publication had the effect of making him known to some of the principal personages of the country, including the Duke of Argyll, his sons the Marquis of Lorn and Lord Archibald Campbell, the Marquis of Tweeddale, and other persons of distinction. Relying upon the support of these noblemen, he offered to the Scottish parliament, in 1705, a plan for removing the difficulties under which the kingdom then laboured from the scarcity of specie, and the stoppage of payments by the bank; and, with a view to further his object, he published another work, entitled *Money and Trade considered, with a Proposal for Supplying the Nation with Money*, which appeared at Edinburgh the same year. His "proposal" was, that commissioners, to be appointed by an act, under the control of parliament, should be empowered to issue notes, either in the way of loan, at ordinary interest, upon landed security, the debt, however, not to exceed half, or at the most two thirds, of the value of the land; or upon land-pledges, redeemable within a certain period, to the full value of the land; or, lastly, upon sale irredeemably to the amount of the price agreed upon. Paper-money, thus issued and secured, would, he conceived, be equal in value to gold and silver money of the same denomination, and might even be preferred to these metals, as not being, like them, liable to fall in value. But this scheme, though supported by the united weight of the court party, and of that called the *squadrone*, headed by the Duke of Argyll and the Marquis of Tweeddale, was rejected by the parliament, which resolved, "that to establish any kind of paper-credit, so as to oblige it to pass, was an improper expedient for the nation." The rejection of the plan was occasioned by an apprehension, that if it were adopted, all the estates of the kingdom would thereby be brought to a complete dependence upon the government.

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[1] In the London Gazette of Monday, 7th January 1695, a reward of fifty pounds was offered for the apprehension of "*Captain* John Law, a Scotchman, lately a prisoner in the King's Bench for murther," who is described as "a very tall, black, lean man, well shaped, above six foot high, large pock-holes in his face, big high nosed, speaks broad and loud." This description, which conveys no very favourable idea of Law's personal appearance, and differs from his real portrait, is supposed by Mr Wood to have been drawn up with a view to facilitate his escape. The prefix of "Captain," which is otherwise a good travelling title, may also, perhaps, be explained on the same hypothesis.

Mr Law now resolved to abandon his native country, and to try his fortune abroad. He resided some time at Brussels, where he became noted for extraordinary success at play; and in two excursions which he made to Paris, his good fortune at the gaming-table became still more conspicuous. Having visited the principal cities of Italy, he continued the same career, playing at all sorts of games, and betting and speculating in the public funds and banks, with uninterrupted success; insomuch that, in the year 1714, he was worth upwards of L.110,000 sterling. During these rambles, Law, having the advantage of a graceful figure and an insinuating address, was everywhere well received by persons of the highest quality. At Florence he became acquainted with the Duke de Vendôme, whom he had the honour to oblige with the loan of a considerable sum of money. At Neufchâtel he obtained access to the Prince of Conti, to whom he imparted some of his financial projects. During a short residence at Turin, he communicated to Victor Amadeus, king of Sardinia, a scheme for aggrandising his territories, of the same nature as that which he afterwards proposed to the Duke of Orleans; but the prudent monarch declined embarking in so perilous an adventure, observing to the projector, that his dominions were too small for the execution of so great a design, and that France was the proper theatre for such speculations. "If I know the disposition of the people of that country," added Victor Amadeus, "I am sure they will relish your schemes; and therefore I would advise you to go thither without delay."

Law took the advice which was thus given him, and returned to Paris, where he arrived in 1714, not long before the death of Louis XIV. He was more favourably received than on the occasions of his former visits, when he appears to have been regarded as a mere adventurer; and soon gained the confidence of the Duke of Orleans to such a degree, that he was not only admitted to the convivial parties of the regent, but even nominated one of his counsellors of state. At this time the French finances were in the greatest disorder, indeed in a situation accounted desperate; the nation was burthened with an immense load of debt, contracted during the expensive wars of Louis XIV.; and the people groaned under the intolerable pressure of the taxes which had been imposed for payment of the interest. All industry was thus checked, and trade in a manner annihilated; manufactures, commerce, and navigation, had almost ceased; the merchant and the trader were reduced to beggary, and the artificer was compelled, for want of employment, to leave the kingdom. In a word, the state of affairs was such, that it had been debated in council, and actually proposed to apply a spunge to the debt, and to seek relief by means of a national bankruptcy. The proposal, however, was rejected by the regent, and a commission appointed to inquire into the claims of the state creditors, and endeavour to introduce some degree of order into the public finances. At this calamitous crisis, when the surplus of the public revenue, after payment of the interest of the debt, was found insufficient to defray the necessary expenses of the civil government, Law came forward with his favourite nostrum or panacea, and proposed to liquidate the debt, by establishing a bank for issuing notes secured upon landed property, and on the unalienable impledgement of all the royal revenues. The project seems to have been approved of, but as the conjuncture was thought unfavourable for risking so bold an experiment, his application proved ineffectual. Nothing discouraged, Law requested and obtained permission to establish a private bank, to consist entirely of funds advanced by himself, and others who chose to embark in the undertaking. The letters-patent, which are dated the 2d and 20th of May 1716, specify the principles upon which the bank had been established, as well as the regulations according to which it was to be conducted. The scheme promised success, and, in fact, the General Bank of Law and Company had acquired great credit, when, in December 1718, it was dissolved by an arrêt of the regent, who, observing the advantages resulting from the establishment, resolved to take it into the hands of government; a resolution which could not be very agreeable to the founder and his associates in the enterprise. Law, however, was named director-general of the Royal Bank, in which his own had merged; and branches were established at Lyons, Rochelle, Tours, Orleans, and Amiens.

Law now began to develope the stupendous project he had long meditated, and which afterwards became so well known to all Europe, under the name of the Mississippi System. This scheme was nothing less than the vesting of the whole privileges, effects, and possessions of all the foreign trading companies, the great farms, the mint, the general receipt of the king's revenues, and the management and property of the bank, in one great company, who, having thus in their hands all the trade, taxes, and royal revenues, might be enabled to multiply the notes of the bank to any extent they pleased, doubling or even tripling at will the circulating medium of the kingdom, and, by the immensity of their funds, possessed of a power to carry the foreign trade and the improvement of the colonies to a height altogether unattainable by other means. This monstrous and impracticable monopoly was approved of by the regent, and by letters-patent a commercial company was established, under the name of the Company of the West; to which was at the same time granted the whole province of Louisiana, a country watered throughout its whole extent by the Mississippi, from which the project accordingly took its name. The scheme was well calculated to entrap the unwary and to seduce the speculative. Of this company 200,000 actions or shares were issued, at 500 livres each, and the subscriptions were made payable in a depreciated paper-currency, called *billets d'état*, which, however, in the subscriptions, was taken at its full value. This could not fail to operate as a tempting bait to the holders of these billets or notes to lay them out in the purchase of shares, especially since the depreciation amounted to between sixty and seventy per cent. The company thus became creditors of the king to the extent of a hundred millions of livres, the interest of which sum was fixed at the rate of four per cent.

Law, who had now advanced high in the regent's favour, was of course named director-general of the Company of the West, and thus intrusted with the development of his own stupendous project. Louisiana having been represented as a region abounding in gold and silver, and possessing a fertile soil capable of the highest cultivation, the actions or shares were bought up with the greatest avidity; and such was the rage for speculation, that the unimproved parts of the colony were actually sold for 30,000 livres the square league. In pursuance of the scheme, the farm of tobacco was made over to the company at an advance of rent exceeding two millions of livres. Soon afterwards they acquired the charter and effects of the Senegal Company; and this was succeeded by a still more important acquisition, namely, the exclusive privilege of trading to the East Indies, China, and the South Seas, together with all the possessions and effects of the China and India companies, now dissolved, upon the condition of liquidating all just claims against them. Upon this occasion, the Company of the West assumed the title of Company of the Indies; and 50,000 new shares were ordered to be constituted, at 550 livres each, payable in coin. The price of actions quickly rose to 1000 livres each. On the 25th of July 1719, the mint was made over to this company for a consideration of fifty millions of livres, to be paid to the king within fifteen months; on the 27th of August following, the regent took out of the hands of the farmers-general, and made over to them, the great farms, for which they agreed to pay an advance of rent of three millions and a half of livres; and, on the 31st of the same month, they also obtained the general receipt or collection of the other branches of the king's revenue. Having acquired all these grants, and thus concentrated in themselves not only the whole foreign trade and possessions of France, but also the collection and management of the royal revenues, they promised an annual dividend of 200 livres on every share; the price of actions instantly rose in the market to 5000 livres; and the public ran with such eagerness upon the last creation of stock, that nearly double the requisite sum was subscribed, whilst the greatest interest was exerted, and every stratagem put in practice, to secure places in that subscription. The frenzy now became general. A rage for the acquisition of shares in the India Company seized and infatuated all ranks in the kingdom. Clergy and laity, peers and plebeians, princes and peasants, statesmen and magistrates, nay, even ladies, all, in short, who either had or could procure money for the purpose, turned stockjobbers, outbidding each other with such avidity, that in November 1719, the price of shares rose to above 10,000 livres, or (when the depreciation of the *billets d'état* is taken into account) more than sixty times the sum they originally sold for. Nothing was talked of but actions; every place echoed with Mississippi and Quinquempoix.[1] All classes appeared to have but one object, one pursuit. Mechanics laid aside their work, tradesmen forsook their shops, and persons of all grades neglected their professions or employments, to embark in this new occupation; whilst even the few who observed some degree of moderation, showed by their conduct how little concern they took in affairs foreign to the Mississippi scheme.[2] The delirium had reached its culminating point.

Mr Law now blazed a meteor of unequalled splendour. He possessed the ear of the Duke of Orleans; he was almost adored by the people, ever ready to worship at the shrine of the idol of the hour; and he was surrounded by princes, dukes, peers, marshals, and prelates, who all courted his friendship, and even seemed ambitious of his patronage. Nobles were content to wait in his antechambers, like the meanest subjects; and ladies of the highest quality employed every artifice, sometimes at the risk of their necks, to attract his passing notice.[3] The property which he acquired was immense. He purchased no less than fourteen estates with titles annexed to them, and amongst these the marquisate of Rosny, which had belonged to the illustrious Sully, the friend and minister of Henry IV. About this period, too, a free pardon for the murder of Mr Wilson was conveyed to him from England; and Edinburgh, proud of having produced so great a personage, transmitted to him the freedom of the city in a gold box. By his abjuration of the Protestant religion, the only obstacle which stood in the way of his advancement to the highest offices in the state was soon afterwards removed; and, on the 5th of January 1720, he was appointed comptroller-general of the finances. A few days previous to this, the Academy of Sciences had elected him one of its honorary members; and the flattering incense of poetry was offered up at the same shrine with the homage of an infatuated people. Thus the astonished world beheld an obscure foreigner, of doubtful reputation and questionable character, rise in a few months from a private condition to the high station of prime minister of France, and govern for a time, with almost absolute power, one of the greatest and most enlightened nations of Europe. It might well be said of him, *Tollitur in altum ut casu graviore cadat.*

But after having raised himself to such an unexampled eminence, Law at length fell a sacrifice to the intrigues of the other ministers, who, partly from envy, and partly from apprehension, combined with ignorance, undermined the insecure fabric he had reared, and thus precipitated its fall. The credit of the bank and of the India Company had attained its height in November 1719, when shares of the latter sold for more than 10,000 livres each, and money was so abundant in the former that the directors agreed to lend any sum upon proper security at two per cent. But amidst the general delirium, there were symptoms which evidently betokened an approaching revulsion. The most alarming of these was a constant drain of specie from the bank, either for the purpose of being hoarded or sent abroad. Astonished at their exorbitant gains, the original proprietors of the company thought only of converting their shares into gold, and realizing the fortunes which they had so suddenly acquired; and it was computed that not less than 500 millions of livres, the property of persons of this description, had been sent out of France. To avert the danger which thus threatened the system, several edicts were issued early in 1720, by which payments in specie were restricted to small sums, and the standard of the coin was kept in continual fluctuation, whilst bank-notes were declared to remain invariable, and rents, taxes, and customs, were made payable in notes. But what crowned all, was the edict of the 27th February 1720, prohibiting individuals, as well as secular or religious communities, from having in their possession more than 500 livres in specie, under the penalty of a fine, and confiscation of all sums found exceeding that amount; a measure which could scarcely fail to sow distrust in the bosom of families, and to excite alarm in the public mind. Still the delusion prevailed. On the 23d of February, a few days before the publication of this edict, the Royal Bank had been incorporated with the company, and the king not only remained guarantee of the bank-notes, but gave up to the company all the profits made by the bank since December 1718, when the government had taken it into its own hands. Meanwhile, the manufacture of notes proceeded with so much activity, that, by the 1st of May 1720, paper-money had been fabricated to the amount of more than 2600 millions of livres, or nearly L.110,000,000 sterling; whilst the specie in the kingdom was estimated at only 1300 millions of livres, or about L.52,000,000 sterling. In this state of matters, Cardinal Dubois and M. d'Argenson represented to the regent that it had become necessary to equalize the proportion between the notes and the coin, either by reducing the value of the one to the extent of a half, or by doubling that of the other.

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[1] The street where the stockjobbing was at first carried on.

[2] The unexampled rise in the price of actions enabled obscure and humble individuals to acquire at once princely fortunes; and many amusing anecdotes are told of persons thus suddenly raised to affluence. A footman having realised a large sum, provided himself with a carriage; but the first day it drew up at his door, obeying the instinctive habit of his calling, he, instead of stepping into the vehicle, mounted up to his old station behind it. Another of the same fraternity, who had obeyed the like familiar impulse, endeavoured adroitly to cover his mistake by pretending that he got up merely to see if there was room at the back for two or three more lacqueys, whom he was resolved to hire instantly. Law's coachman had made so great a fortune that he asked a dismission from the service of his master, which was granted, on condition of his procuring another as good as himself. Cook-maids and waiting-women appeared at the opera bedizzened with jewels and finery; many who had not a dozen livres in the world suddenly "tumbled from a garret into a carriage;" and the son of a baker at Toulouse, being desirous of having a superb service of plate, purchased the contents of a goldsmith's shop for 400,000 livres, and sent them home to his wife, with orders to set them out properly for supper. In a word, property underwent a new and most grotesque distribution.

[3] The regent's mother asserts, in one of her letters, that "si Laws le vouloit, les femmes Françoises lui baiseroient la derrière;" a strong expression, certainly, but one which shows that all ideas of delicacy, or even decency, were absorbed by the cupidity and avarice which had taken possession of the public mind.

This extraordinary point was debated in council, where it was opposed by some of the members, amongst whom was the comptroller-general, who strenuously contended for letting matters remain as they were; but the majority being in favour of the proposition for lowering the value of the paper, it was decided accordingly; and, on the 21st of May 1720, an edict was issued, which, contrary to all sound policy, and even to the most solemn stipulations, reduced the value of the company's bank-notes one half, and fixed their actions or shares at 5000 livres. By this unjustifiable and fatal step, the whole paper fabric was destroyed in an instant, the notes lost all credit, and next day a man might have starved with 100 millions of paper money in his pocket. The consternation with which all ranks were seized was soon converted into rage, and it became necessary to station troops in different parts of the capital, to prevent the consequences to be apprehended from the fury and despair of the populace. Disorder and confusion reigned everywhere; seditious and inflammatory libels were posted up and distributed; and the life of the regent himself was threatened.[1] Some conception may be formed of the distress of the people, when it is considered that at the time when the bank thus stopped payment, and the value of paper money instantly sunk to zero, not less than 2,235,085,590 livres, or upwards of L.90,000,000 sterling in notes, were in circulation. Law was of course peculiarly obnoxious to popular odium, which he endeavoured in vain to allay by resigning into the hands of the regent his office of comptroller-general, on the 29th of May; but, though several times exposed to imminent danger, from the vengeance both of the parliament and the people, he remained in France until towards the close of the year 1720, when he withdrew to Brussels; and soon afterwards his whole property was confiscated, and his brother William sent to the Bastile.

Law arrived at Brussels on the 22d of December 1720, and, after waiting there for some time, in the vain expectation of being recalled to France, set out for Venice, which he reached early in January 1721; he then visited other places on the Continent, and, in October, arrived in England, for the ostensible purpose of pleading the king's pardon. He was at first well received, and visited by persons of distinction; but when it was discovered that the fallen financier was in a state almost bordering upon destitution, his friends began to fall off, and, of those who had known or perhaps courted him in his day of power, he could find none good-natured enough to lend him a thousand pounds. In a letter addressed to Mrs Howard, afterwards Countess of Suffolk, he calls that lady his "only friend;" an avowal which affords a striking instance of the instability of fortune, power, and friendship. After residing some years in England, this extraordinary man returned once more to the Continent, and closed his chequered career at Venice, where, on the 21st of March 1729, he died in a state but little removed from indigence, in the fifty-eighth year of his age. Soon after his death appeared the following epitaph, the point of which reminds us of the bitter jests which appeared upon the occasion of his fall:—

Ci gît cet Ecossois célèbre,
Ce calculateur sans égal,
Qui, par les règles de l'algèbre,
A mis la France à l'hôpital.

We do not think that any great difference of opinion can now be entertained respecting the real character of Law's project; and indeed it seems to be generally agreed that, even if it had not been violently interrupted by the edict of the regent, it was too insecure in its principles to have proved permanent. The favourite maxim inculcated by Law, and upon which his whole fabric of the Mississippi system was reared; namely, that the power and prosperity of a nation increase in proportion to the quantity of money circulating therein, and that, as the richest nations have not specie sufficient to afford full employment to their inhabitants, this defect may be supplied by paper credit; involves a dangerous fallacy, even in the most restricted view that can be taken of its application, inasmuch as it implies that paper money may be issued with advantage to an almost unlimited extent, upon general security; and that its credit, or, in other words, its value, may thus be maintained without its being rendered convertible at pleasure into cash. But all experience has proved that this is absolutely impossible. When paper is in excess, in comparison with the total amount of gold and silver currency, it necessarily becomes depreciated; the prices of commodities experience a corresponding rise; the nominal value of the precious metals is increased in proportion to the amount of the depreciation, of which this increase is the only measure, and they disappear from circulation. All existing contracts and obligations are disturbed; debtors benefited at the expense of creditors; a spirit of reckless speculation and adventure is thus engendered; and, after a time, the crisis of revulsion and ruin arrives. Whenever the quantity of money in circulation is too great in propor-

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[1] Even in this season of calamity, the French exemplified the indestructible gaiety of their national character, by sporting with their own misfortunes in jests and epigrams. The following hebdomadal record is, perhaps, unique amongst *jeux d'esprits.*

Lundi j'achetai des actions;
Mardi je gagnai des millions;
Mercredi j'arrangeai mon ménage;
Jeudi je pris un équipage;
Vendredi je m'en fus au bal;
Et Samedi à l'hôpital.

The Abbé, afterwards Cardinal, de Tencin, having had the principal share in Mr Law's conversion, a service for which he was rewarded by the bishopric of Grenoble, is thus addressed by a malicious epigrammatist:—

Foin de ton zèle séraphique,
Malheureux Abbé de Tencin!
Depuis que Laws est Catholique,
Tout le royaume est Capuçin.

Law, Edmund.

tion to the total amount of commodities to be circulated by it, depreciation is the necessary consequence, or, in other words, a proportional rise in the price of commodities. Money has no creative power, as Law seems all along to have imagined, and can never be in excess without endangering "the power and prosperity" of the nation where this is the case. His whole system, therefore, was built upon a sandy foundation, and, even if it had received no rude or sudden shock, would have fallen to pieces from its own insecurity and instability. At the same time, there is much truth in an observation of Mr Burke, in his *Reflections on the French Revolution.* "It is not true," says he, "that Law built solely on a speculation concerning the Mississippi; he added the East India trade, he added the African trade, he added the farms of all the farmed revenue of France; all these unquestionably could not support the structure which the public enthusiasm, not he, chose to build on these bases." He laid the best foundation that he could, perhaps the best which, in the circumstances, it was possible to lay; but the nation went suddenly mad, an event which he could scarcely have foreseen; the company was hurried onwards by the general frenzy; and when the delirium had reached its height, the regent was advised to issue the fatal edict, which levelled the whole fabric with the dust.

(See *Œuvres de Law,* passim; *Histoire du Système des Finances,* tom. i.; Pollnitz, *Mémoires;* Massillon, *Mémoires de la Minorité de Louis XV.; Mémoires de la Regence de M. le Duc d'Orleans,* tom. i.; Richelieu, *Mémoires,* tom. iii.; Voltaire, *Siècle de Louis XV.;* Chalmers's *Biog. Dict.* art. LAW; Wood, *Life of John Law of Lauriston,* Edinburgh, 1824.) (A.)

LAW, *Edmund,* bishop of Carlisle, was born in the parish of Cartmel, in Lancashire, in the year 1703. His father, who was a clergyman, held a small chapel in that neighbourhood; but the family had been situated at Askham, in the county of Westmoreland. He was educated for some time at Cartmel school, and afterwards at the free grammar-school of Kendal, from which he went, well instructed in the learning of grammar-schools, to St John's College in Cambridge.

Soon after taking his first degree, he was elected fellow of Christ College in that university. During his residence in this college, he became known to the public by a translation of Archbishop King's *Essay on the Origin of Evil,* with copious notes; in which many metaphysical subjects, curious and interesting in their own nature, are treated of with ingenuity, learning, and novelty. To this work was prefixed, under the name of a preliminary dissertation, a very valuable piece, written by the Reverend Mr Gay of Sidney College. He also, whilst at Christ College, undertook and went through a laborious task, in preparing for the press an edition of Stephens's *Thesaurus.* His acquaintance, during this his first residence in the university, was principally with Dr Waterland, the learned master of Magdalen College; Dr Jortin, a name known to every scholar; and Dr Taylor, the editor of the *Demosthenes.*

In the year 1737 he was presented by the university to the living of Graystock in the county of Cumberland, a rectory of about L.300 a year. The advowson of this benefice belonged to the family of the Howards of Graystock, but devolved to the university, for this turn, by virtue of an act of parliament, which transferred to these two bodies the nomination to such benefices as appertained, at the time of the vacancy, to the patronage of a Roman Catholic. The right, however, of the university was contested; and it was not until after a law-suit of two years' continuance that Mr Law was settled in his living. Soon after this, he married a daughter of Mr John Christian of Unerigg, in the county of Cumberland.

In 1743, he was promoted by Sir George Fleming, bishop of Carlisle, to the archdeaconry of that diocese; and in 1746 he went from Graystock to reside at Salkeld, a pleasant village upon the banks of the river Eden, the rectory of which is annexed to the archdeaconry. Mr Law was not one of those who lose and forget themselves in the country. During his residence at Salkeld, he published Considerations on the Theory of Religion; to which were subjoined, Reflections on the Life and Character of Christ, and an appendix concerning the use of the words Soul and Spirit in Holy Scripture, and the state of the Dead there described.

At this time Dr Keene held, with the bishopric of Chester, the mastership of Peterhouse in Cambridge. Desiring to leave the university, he caused Dr Law to be elected to succeed him in that station. This took place in the year 1756, in which Dr Law resigned his archdeaconry in favour of Mr Eyre, a brother-in-law of Dr Keene. Two years before this, he had taken his degree of doctor of divinity, in his public exercise for which, he defended the doctrine of what is usually called the "sleep of the soul."

About the year 1760, he was appointed principal librarian of the university; a situation which, as it procured him an easy access to books, was peculiarly agreeable to his taste and habits. Some time after this, he was also appointed casuistical professor. In the year 1762, he suffered an irreparable loss by the death of his lady. Some years afterwards, he received several preferments, which were rather honourable expressions of regard from his friends, than of much advantage to his fortune.

Dr Cornwallis, then bishop of Litchfield, afterwards archbishop of Canterbury, who had been his pupil at Christ College, appointed him to the archdeaconry of Staffordshire, and to a prebend in the church of Litchfield. Dr Green, bishop of Lincoln, his old acquaintance, made him a prebendary of that church. In the year 1767, he obtained a stall in the cathedral church of Durham, by the intervention of the Duke of Newcastle, to whose interest, in the memorable contest for the high stewardship of the university, he had adhered, in opposition to some strong temptations. The year after this, the Duke of Grafton, who had a short time before been elected chancellor of the university, recommended the master of Peterhouse to his majesty for the bishopric of Carlisle. This recommendation was made not only without solicitation on his part or on that of his friends, but without his knowledge, until the duke's intention in his favour was signified to him by the archbishop.

About the year 1777, Bishop Law gave to the public a handsome edition, in three volumes quarto, of the works of Mr Locke, with a Life of the Author, and a Preface. Mr Locke's writings and character he held in the highest esteem, and seems to have drawn from them many of his own principles. He was a disciple of that school. About the same time he published a tract, which attracted some attention, on the controversy concerning subscription; and he published new editions of his two principal works, with considerable additions, and some alterations.

Dr Law held the see of Carlisle for nearly nineteen years, during which time he twice only omitted spending the summer months in his diocese at the bishop's residence at Rose Castle; a situation with which he was much pleased, not only on account of the natural beauty of the place, but because it restored him to the country in which he had spent the best part of his life. In the year 1787, he paid this visit in a state of great weakness and exhaustion, and died at Rose Castle about a month after his arrival there, on the 14th of August, being then in the eighty-fourth year of his age.

The life of the Bishop of Carlisle was a life of incessant reading and thought, almost entirely directed to metaphysical and religious inquiries. Besides the works already mentioned, he published, in 1734 or 1735, a very ingenious Inquiry into the Ideas of Space and Time, in which he

Law, William.

combats the opinions of Dr Clarke and his adherents on these subjects; but the tenet by which his name and writings are principally distinguished is, "that Jesus Christ, at his second coming, will, by an act of his power, restore to life and consciousness the dead of the human species, who, by their own nature, and without this interposition, would remain in the state of insensibility to which the death brought upon mankind by the sin of Adam had reduced them." He interpreted literally that saying of St Paul (1 Cor. xv. 21), "As by man came death, by man came also the resurrection of the dead." This opinion had no other effect upon his own mind than to increase his reverence for Christianity, and for its divine founder. He retained it, as he did his other speculative opinions, without laying, as many are wont to do, an extravagant stress upon their importance, and without pretending to more certainty than the subject admitted of. No man formed his own conclusions with more freedom, or treated those of others with greater candour and equity. He never quarrelled with any person for differing from him, or considered that difference as a sufficient reason for questioning any man's sincerity, or judging meanly of his understanding. He was zealously attached to religious liberty, because he thought that it leads to truth; yet from his heart he loved peace. There was nothing in his elevation to his bishopric which he spoke of with more pleasure, than its being a proof that decent freedom of inquiry was not discouraged.

He was a man of great softness of manners, and of the mildest and most tranquil disposition. His voice was never raised above its ordinary pitch. His countenance seemed never to have been ruffled; it preserved the same kind and composed aspect, truly indicating the calmness and benignity of his temper. He had an utter dislike of large and promiscuous companies. Next to his books, his chief satisfaction was in the serious conversation of a literary companion, or in the company of a few friends. In this sort of society he opened his mind without reserve, and with a peculiar turn and sprightliness of expression. His person was low, but well formed; and his complexion fair and delicate. Except occasional interruptions by the gout, he had for the greater part of his life enjoyed good health; and, when not confined by that distemper, he was full of motion and activity. About nine years before his death, he was greatly enfeebled by a severe attack of the gout in his stomach, and, a short time afterwards, lost the use of one of his legs. Notwithstanding his fondness of exercise, he resigned himself to this change, not only without complaint, but without any sensible diminution of his cheerfulness and good humour. His fault was the general fault of retired and studious characters, too great a degree of inaction and facility in his public station. The modesty, or rather bashfulness, of his nature, together with an extreme unwillingness to give pain, rendered him sometimes less firm and efficient in the administration of authority than was requisite. But this is the condition of human frailty. There is an opposition between some virtues which seldom permits them to subsist together in perfection.

Law, *William*, the author of many pious works, some of which obtained great popularity, was born at King's-cliffe, Northamptonshire, in the year 1686. Having completed his school education, he entered Emmanuel College, Cambridge, in 1705; commenced bachelor in 1708; was elected a fellow of his college in 1711; and took his degree of master of arts in 1712. Soon after the accession of George I. being called upon to take the oaths, and sign the declaration prescribed by act of parliament, he refused, and in consequence vacated his fellowship in 1716, after which he was considered as a nonjuror. It appears that he had for some time officiated as a curate in London, but had obtained no ecclesiastical preferment. Soon after his resignation of his fellowship, he went to reside at Putney, as tutor to Edward Gibbon, father of the historian of the same name; but how long he remained in this situation has not been ascertained. In 1727, he founded at Cliffe an alms-house for the reception of two old helpless women, and a school for the instruction and clothing of fourteen girls. The money which he thus applied was, it seems, the gift of an unknown benefactor. Whilst standing at the door of a shop in London, he was accosted by a person he had never seen before, who, having inquired his name, as well as whether he was of King's-cliffe, and received a satisfactory answer on both points, put into his hands a sealed paper, containing a bank note for a thousand pounds. There is no evidence that this money was given him in trust for purposes of charity, and he is therefore fully entitled to the merit of having appropriated it for the benefit of the poor. It appears that, some time before 1740, he was instrumental in bringing about an intimacy between Mrs Hester Gibbon, the sister of his pupil, and Mrs Elizabeth Hutcheson, the widow of a gentleman of the Middle Temple. This circumstance, trifling as it may seem, decided the direction and character of his future life. These ladies, being of congenial sentiments, formed a plan of living together in the country, secluded from the world, and of assuming Mr Law as their chaplain, instructor, and almoner. With this view, they ultimately settled at King's-cliffe, in a house prepared for their reception by Mr Law, and which formed the only property that had been devised to him by his father. Here their whole income, after deducting necessary expenses, was employed in acts of beneficence to the needy and the afflicted, or in donations of larger amount to persons of a somewhat higher grade who had known better days, but whom misfortune had reduced to poverty. In this situation Law remained twenty years, and died on the 9th of April 1761, in the seventy-fifth year of his age.

Gibbon, in his *Miscellaneous Works*, has drawn the character of Law in the happiest manner, and for once commended a man of piety, not only without irony, but even with a feeling approaching to affection. "In our family," says the historian, "he left the reputation of a worthy and pious man, who believed all that he professed, and practised all that he enjoined. The character of a nonjuror, which he maintained to the last, is a sufficient evidence of his principles in church and state; and the sacrifice of interest to conscience will always be respectable. His theological writings, which our domestic connexion has tempted me to peruse, preserve an imperfect sort of life, and I can pronounce with more confidence and knowledge on the merits of the author. His last compositions are darkly tinctured by the incomprehensible visions of Jacob Behmen; and his discourse on the absolute unlawfulness of stage-entertainments is sometimes quoted for a ridiculous intemperance of sentiment and language. But these sallies of religious phrensy must not extinguish the praise which is due to Mr William Law as a wit and a scholar. His argument on topics of less absurdity is specious and acute, his manner is lively, his style forcible and clear; and, had not his vigorous mind been clouded by enthusiasm, he might be ranked with the most agreeable and ingenious writers of the times. While the Bangorian controversy was a fashionable theme, he entered the lists on the subject of Christ's kingdom, and the authority of the priesthood; against the *Plain Account of the Sacrament of the Lord's Supper*, he resumed the combat with Bishop Hoadly, the object of Whig idolatry and Tory abhorrence; and at every weapon of attack and defence, the nonjuror, on the ground which is common to both, approves himself at least equal to the prelate. On the appearance of the *Fable of the Bees*, he drew his pen against the licentious doctrine that private vices are public benefits, and morality as well as religion must join in his applause. Mr Law's master-work, the *Serious Call*, is still read as a popular and powerful book of devotion. His precepts are rigid, but they are founded on the gospel; his satire is sharp, but it is drawn from the knowledge of human life; and many of his portraits are not unworthy of the pen of La Bruyère. If he finds a spark of piety in the reader's mind, he will soon kindle it to a flame; and a philosopher must allow that he exposes, with equal severity and truth, the strange contradiction between the faith and practice of the Christian world."

Mr Law's works amount to nine volumes octavo, comprising, besides a collection of letters, sixteen distinct treatises, which, however, it is unnecessary to enumerate, seeing they are all printed together. Although Law is best known as a devotional writer, and there can be no doubt that his *Serious Call*, and *Christian Perfection*, have proved eminently useful in leading many to think in earnest of religion, yet his merits as a controversial writer are of a very high order, and, in respect of style, wit, and argument, his letters to Bishop Hoadly are amongst the finest specimens of polemical composition to be found in our language. (A.)

LAWLESS COURT, a court said to have been held annually on the King's Hill at Rochford, in Essex, on the Wednesday morning after Michaelmas day, at cock-crowing, where they whispered, and had no candle, nor any pen and ink, but only a coal. Persons who owed suit or service, and did not appear, forfeited double their rent every hour they were missing. This servile attendance, Camden informs us, was imposed on the tenants for conspiring at the like unseasonable hour to raise a commotion. The court belonged to the honour of Raleigh, and to the Earl of Warwick, and was called *lawless*, from its being held at an unlawful hour.

LAWN, in manufactures, a fine sort of linen, remarkable for being used in the sleeves of the clerical dress of bishops.

LAWRENCE, SIR THOMAS, a celebrated English painter, was born at Bristol, on the 13th of April 1769. His father, who kept an inn, first in Bristol, and afterwards in Devizes, made some pretensions to literary taste, and was in the habit of reciting poetry; an accomplishment which his son acquired at a very early age, as well as that of taking likenesses with striking fidelity. One of the earliest instances recorded of young Lawrence's genius is to be found in an incident which occurred to Lord and Lady Kenyon, some years previous to the time when the former was elevated to the peerage. Happening to remain for a day at the inn of the elder Lawrence, they were introduced by Boniface to his son, who, he said, "although then only in his fifth year, could recite them poetry or speeches, or take their likenesses." The visitors agreed that the boy's skill with the pencil should be put to the test; and the future president having been lifted on the table, and seated in an arm-chair, took their likenesses, with a rapidity, a spirit, and a correctness, which astonished them. With the exception of a few lessons in Latin and French, obtained through a private channel, all the education which young Lawrence received, he acquired between his sixth and eighth year; but his was a mind capable of educating itself, and long ere the young artist attracted public attention, he had treasured up a more than ordinary stock of knowledge. But drawing, particularly taking likenesses, chiefly occupied his attention until he was ten years of age, when he began of his own accord to attempt original compositions of the highest class. The subjects which he chose were of the most ambitious description, such as Peter denying Christ, Haman and Mordecai, and the like. His fame as an artist now spread amongst the families of distinction in the surrounding counties; and not long afterwards, the Honourable Daines Barrington noticed him in his *Miscellanies*, as a striking instance "of early genius in children." The elder Lawrence having failed in business, removed to Bath, where he placed his son for some time with a celebrated crayon painter, under whom he made surprising progress. At this time he executed, at half a guinea each, likenesses of the fashionables of Bath; and this initiatory exercise in drawing individuals in high life, arrayed in their gay and elegant costume, had, doubtless, considerable influence in forming the style of the artist, and preparing him to become the painter of patricians. He now numbered amongst his warm admirers and patrons persons of rank and fortune; but the most remarkable incident in his early career, was his receiving the great silver pallet from the Society of Arts, with a present of five guineas. These marks of distinction were conferred upon him for executing in crayons the Transfiguration of Raphael, when he was only thirteen years of age. His large crayon drawings became in great request; and in Oxford, Salisbury, and other places which he visited, he obtained considerable employment for his pencil. When in his sixteenth year, he conceived a strong desire to appear upon the stage; but the remonstrances of his friends induced him to abandon this project; and about a year afterwards, he made his first attempt in oil painting. In 1787 he removed to London, where he availed himself of the public institutions for instruction in his art, and commenced that career which terminated so triumphantly. He was received at the house of Sir Joshua Reynolds, and encouraged by the great head of the English school of art. His admission as a student at the Royal Academy, and his first appearance in the exhibition at Somerset House, soon followed his arrival in the metropolis. Each succeeding year he increased the number of the performances which he sent in; and his reputation growing apace, he was elected an associate of the Royal Academy on the 10th of November 1791.

The death of Sir Joshua Reynolds in 1792 opened up a fair field of competition for aspiring genius; and although Mr Lawrence was then only in his twenty-third year, it soon became apparent that he was destined to bear away the palm from the most gifted artists with whom he had to contend. The Dilettanti Society unanimously chose him as their painter in the room of Sir Joshua; and his majesty George III. also appointed him to succeed the deceased president, as his principal painter in ordinary. On the 10th of February 1794, Mr Lawrence was elected a royal academician; and employment now flowed upon him from all quarters. He made the most rapid progress in his profession, and his reputation grew steadily until he came to be generally considered as the first portrait painter of the age. An enumeration of the works of this description which he executed would comprehend all the rank, fashion, and intelligence which distinguished the times in which he lived, including those of most of the crowned heads of Europe. The royal family, the nobility and gentry, distinguished men of letters and statesmen, actors and actresses, all sat for their portraits to Lawrence. It may be justly said of him as it was said of Sir Joshua Reynolds, that "he painted three generations of beauties." In 1815 the Prince Regent conferred on him the honour of knighthood; and in 1818, at the request of the same illustrious individual, he was induced to proceed to Aix-la-Chapelle, to take likenesses of the most distinguished statesmen who had there assembled for diplomatic purposes. Having executed his mission at Aix-la-Chapelle, Sir Thomas proceeded to Vienna, and thence to Rome, where he had an opportunity of contemplating for the first time the great masterpieces of ancient art. During the whole of his residence on the Continent, he was received by the sovereigns of the different countries he visited, and entertained with marked distinction; and the propriety and elegance of his deportment made an impression highly favourable to his character as an English artist and gentleman. After an

Lawrence, St.

absence of eighteen months, he returned to England; but, before reaching his native country, he had been unanimously elected to succeed Mr West as president of the Royal Academy; and this office he continued to hold till his death, which took place on the 7th of January 1830.

In portrait-painting, the branch of art which he made his profession, Sir Thomas Lawrence was the most distinguished artist of the day. He was one of the few English painters who attained a proficiency in their art before visiting Italy, or without studying the old masters; a circumstance which must be attributed to his strong native genius and exquisite taste. The distinguishing characteristic of his style was the power of conveying a faithful resemblance, with, at the same time, a singularly delicate sense of beauty, grace, elegance, and dignity. An able writer thus speaks of him: "No painter who ever lived seemed to have dived more deeply into individual character, as conveyed by the conformation of the visage, and the expression of the features; and none knew more skilfully how to avail himself of the changeful appearances which they betrayed in those conversations which were dexterously introduced during the sitting, and which destroyed or relaxed a rigidity of muscle assumed on such occasions, and which frequently baffles the utmost ingenuity of the artist. In his female portraits (the great test of talent) he had more grace and a greater variety of attitude than Vandyke, although he certainly did not equal him in colouring. It is a general opinion also, among painters, that he had less nature and less breadth than Sir Joshua Reynolds; and that opinion is probably well founded. Sir Thomas, especially in the latter periods of his practice, exhibited more detail in his portraits, and appeared to paint with a smaller pencil, than his illustrious predecessor, who in his effects of light and shade seemed to take Correggio as his model. The hair in Sir Thomas's pictures was painted in fine masses, in a way peculiar to himself; and his eyes, to the splendour of which he sometimes made great sacrifices, were divine. The late Mr Fuseli, who was by no means a thorough-going admirer even of Sir Thomas, has been heard to say of him, 'But he paints eyes better than Titian.'"

His drawing was admirable, and some of his chalk sketches are considered by the best judges as fine as Michel Angelo or Raffaelle could have executed. Sir Thomas did not confine himself to portrait-painting alone, but executed paintings of a far higher order of art. Of these it has been observed by Mr Westmacott, "His illustrations of Cato, Coriolanus, and Hamlet, may be considered historical works, and examples of his creative genius, possessing a vigour of imagination, a propriety of sentiment, a breadth and chasteness of composition, worthy to be ranked with the classical and distinguished efforts of the sixteenth century; whilst his more comprehensive powers were displayed in the admirable picture of Satan: all eminent proofs that he possessed talents equal to the accomplishment of the highest designs in the art." In private life Sir Thomas Lawrence was most exemplary, being kind and liberal to artists, and ready to encourage rising merit. In discharge of his duties connected with the high station which he filled in relation to the academy, he displayed unremitting diligence and zeal; "and no man," says an academician, "died with better claims to the respect of his brother members." (R. R. R.)

LAWRENCE, *St*, a river of North America, and one of the largest in the world. It takes its origin in the magnificent basin of Lake Superior, in Upper Canada, and has a course to the sea of nearly 3000 miles. It is the grand outlet by which the immense Lakes Superior, Huron, Michigan, Erie, and Ontario, pour their surplus waters into the ocean through the Gulf of St Lawrence. The remotest spring of this great river is the stream called St Lewis, in lat. 48. 30. N. and long. about 93. W. From its source the general direction through Lakes Superior and Huron is south-east to Lake Erie, nearly due east from that lake, and then north-east to the sea. It receives in its vast course almost all the rivers that rise in the extensive range of mountains to the northward, called the Land's Height, which separate the waters falling into Hudson's Bay from those that descend into the Atlantic, together with all the rivers that have their sources in the ridge which commences on its southern bank, running nearly south-west to where the ridge falls on Lake Champlain. In different parts of its course this great river is known by different names. From the sea to Montreal it is called *St Lawrence;* from thence to Kingston in Upper Canada, the *Cataraqui* or *Iroquois;* between Lakes Ontario and Erie, the *Niagara;* between Lakes Erie and St Clair, the *Detroit;* between Lakes St Clair and Huron, the *St Clair;* and between Lakes Huron and Superior, the distance is called the *Narrows* or *Falls of St Mary.* There is thus formed an uninterrupted connection of upwards of 2000 miles. It is navigable for ships of the line to Quebec, about 400 miles; and to Montreal, a distance of 580 miles from the sea, for ships of 600 tons burden. The distance from Montreal to Lake Ontario is about 200 miles. The breadth of the river between Montreal and Quebec is from half a mile to four miles, the average breadth being about two miles. Below Quebec it gradually widens till it enters the gulf, where, from Cape Rosier to the Mingan settlement on the coast of Labrador, it is about 105 miles in breadth. The St Lawrence discharges annually into the ocean about 4,277,880 millions of tons of fresh water, of which 2,112,120 millions of tons may be reckoned melted snow; the quantity discharged before the thaw comes on being 4512 millions of tons per day for 240 days, and the quantity after the thaw begins being 25,560 millions per day for 125 days, the depth and velocity when in and out of flood being duly considered. Hence, a ton of water being nearly equal to fifty-five cubic yards of pure snow, the St Lawrence frees a country of more than 2000 miles square covered with it to the depth of three feet. The embouchure of this mighty stream is that part of the Gulf of St Lawrence where the island of Anticosti divides the mouth of the river into two branches. The solid contents of the St Lawrence, embracing Lakes Superior, Huron, Michigan, Eric, and Ontario, have been estimated at 1,547,792,360,000 cubic feet, and the superficial area being 72,930 square miles, the water therein would form a cube of nearly twenty-two miles on each side. The river, and the whole country, from the lowest parishes to Quebec, unfold scenery, the magnificence of which, in combination with the most delightful physical beauty, is certainly unequalled in America, and probably in the world. As the eminence is ascended, over which the post-road passes, or in sailing up or down the St Lawrence, there are frequently prospects which open a view of from fifty to one hundred miles of a river from ten to twenty miles in breadth. The imposing features of these vast landscapes exhibit lofty mountains, wide valleys, bold headlands, luxuriant forests, cultivated fields, pretty villages, and settlements (some of them stretching up along the mountains); fertile islands overspread with cottages, pastures, and flocks; rocky islets, and tributary rivers, some of them rolling over precipices, and one of them, Saguenay, like an inland mountain lake, bursting through a perpendicular chasm in the granitic chain; whilst, on the surface of the St Lawrence, majestic ships, large brigs, and vessels and boats of every description, present a spectacle at once sublime and beautiful, and calculated to charm the mind of the beholder. Of course the trade carried on by means of this river is very great. An account of it will be found in the article CANADA. (R. R. R.)

LAWRENCE, *Gulf of St*, the gulf which receives the waters of the numerous lakes and rivers of the Canadian portion of the American continent, and is formed by the western coast of Newfoundland, the eastern shores of Labrador, the eastern extremity of the province of New Brunswick, and by part of Nova Scotia and the island of Cape Breton. It communicates with the Atlantic by three different channels, namely, by the Gut of Canso, which divides Cape Breton from Nova Scotia, by a wider and main channel between Cape North in Cape Breton Isle and Cape Ray in Newfoundland, and by the narrow straits of Belleisle, which separate the coast of Labrador from Newfoundland. The distance from Cape Rosier, Gaspé Bay, to Cape Ray in Newfoundland, is seventy-nine leagues; and from Nova Scotia to Labrador, the distance is one hundred and six leagues. Several islands are situated in the gulf, of which the one most dangerous to navigators is St Paul's, a small barren isle lying between Newfoundland and Cape Breton. On the south side of the bay is St John's or Prince Edward's Island; to the northward are the small Magdalen Islands, eleven in number; north of the Magdalens is Brion's Island; and beyond this are the Bird Isles or Rocks, the most northerly of which is in lat. 47. 50. 28. north, and long. 61. 12. 53. west. On this island it is proposed to erect a light-house.

LAY, a kind of ancient poem amongst the French, consisting of very short verses.

There were two sorts of lays, the *great* and the *little*. The first was a poem consisting of twelve couplets of verses, of different measures. The second was a poem consisting of sixteen or twenty verses, divided into four couplets. These lays were the lyric poetry of the old French poets, and were imitated by some of the English. They were principally used on melancholy subjects, and are said to have been formed on the model of the trochaic verses of the Greek and Latin tragedies.

Lay-Brothers, amongst the Catholics, those pious but illiterate persons who at some convent devote themselves to the service of the religious. They wear a different habit from that of the religious, but never enter into the choir, nor are present at the chapters; nor do they make any vow except those of constancy and obedience. In the nunneries there are also lay-sisters.

Lay-Man, one who follows a secular employment, and has not entered into holy orders.

LAYERS, in *Gardening*, are tender shoots or twigs of trees, laid or buried in the ground, till, having struck root, they are separated from the parent tree, and become distinct plants. The propagating of trees by *layers* is done in the following manner: The branches of the trees are slit a little way, and laid under the mould for about half a foot; the ground should first be made very light, and after they are laid they should be gently watered. If they do not remain easily in the position they are put in, they should be pegged down with wooden hooks. The best season for doing this is, for evergreens, towards the end of August, and, for other trees, in the beginning of February. If they be found to have taken root, they are then cut off from the main plant the succeeding winter, and planted out. If the branch be too high from the ground, a tub of earth is raised to a proper height for it. Some pare off the rind, and others twist the branch, before they lay it; but this is not necessary. The end of the layer should be about a foot out of the ground; and the branch may either be tied tightly round with a wire, or cut upwards from a joint, or cut round for an inch or two at the place; and it is a good method to pierce several holes through it with an awl above the part tied with the wire.

LAZAR-HOUSE, or LAZARETTO, a public building, of the nature of an hospital, to receive the poor, and those afflicted with contagious distempers. In some places, lazarettos are appointed for the performance of quarantine; in which case those only are confined in them who have come from places suspected of being infected with the plague.

LEAD, a metal of a white colour, inclining to blue, and the least ductile, the least elastic, and the least sonorous of all the metals, but possessing a considerable degree of specific gravity.

The lead mines of Great Britain have been wrought from a very remote era. Previously to 1289, however, it would seem that those of Derbyshire only had been explored. But in the year now mentioned lead mines were discovered in Wales; and traces of silver having also been found in them, they were wrought with increased assiduity and attention. The present produce of the lead mines of Great Britain cannot be ascertained with any degree of accuracy. The lead mines of Derbyshire have been supposed to yield 5000 or 6000 tons annually; but they are said to be on the decline. Those upon the borders of Cumberland and Northumberland are supposed to yield, at an average, from 11,000 to 12,000 tons. The total produce of the Scotch mines is estimated at above 4000 tons. Subjoined is a table showing the past and present state of the trade in this article.

Exports and Imports of Lead, Lead Ore, and Preparations of Lead, for Thirteen Years ending 5th January 1833.

	EXPORTS.								IMPORTS.	
Years.	Pig and Rolled Lead and Shot.	Litharge.	Red Lead.	White Lead.	Lead Ore.	Total British Lead and Lead Ore.	Foreign Lead in Pig.	Foreign Lead Ore.	Lead.	Lead Ore.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1821	18,300	395	229	603	252	19,779	4	...	4	...
1822	15,646	573	242	652	287	17,400	...	...	...	275
1823	13,784	576	441	574	455	15,830	69	12	72	811
1824	11,044	816	280	549	225	12,914	298	9	369	177
1825	10,833	586	338	885	350	12,991	749	...	712	191
1826	8,616	831	338	616	139	10,560	3,655	...	6,163	1,603
1827	10,222	901	408	629	249	12,409	1,847	...	913	1,120
1828	13,275	1,140	534	1,012	256	16,217	2,282	...	2,164	1,076
1829	10,001	1,545	382	1,133	195	13,256	1,785	...	2,450	5,016
1830	6,832	463	382	750	220	8,647	1,700	...	1,533	175
1831	7,442	490	520	662	194	9,308	859	...	662	341
1832	6,777	335	281	435	105	7,933	1,234	...	1,232	321
1833	12,181	433	396	652	236	13,898	957	...	1,090	269

More than a third part of the whole lead sent out of the country in 1833 went to the United States, about 3000 tons to the East Indies and China, 1483 tons to Russia, and the remainder, in comparatively insignificant quantities, to various other countries. The decline of trade which has taken place since 1821 has been attributed to the opening of very rich mines in Spain; whilst the cheapness and facility with which they can be wrought enables the Spaniards to undersell every other country. The price of lead has fluctuated very much. The average price from 1800 to 1810 was L.27. 14s. 6d. per ton; from 1811 to 1821, L.23. 6s. 6d. per ton; and from 1822 to 1832, L.20. 7s. per ton. In 1832 the price had sunk as low as L.13. 10s. per ton, but it has since risen; indeed there is scarcely any article the price of which is subject to such variations. In France the consumption is rapidly increasing, and it is nearly all imported from Spain. The importations have increased from 6,211,500 kilogrammes, at an average of the four years ending 1822, to 15,742,192 kilogrammes, at an average of the two years ending with 1830. The lead-mines of the United States are as productive as any in the world, and have recently become of considerable importance. Those on Fever River produced in 1832 about 1412 tons. American manufactures of white and red lead, as well as shot, now nearly supply the domestic market.

LEAF, a part of a plant extended into length and breadth in such a manner as to have one side distinguishable from the other. This is Miller's definition. Linnæus denominates leaves the organs of motion, or muscles of the plant. See Physiology, Vegetable.

Leaf-*Skeletons.* One help for acquiring a knowledge of the anatomy of plants, is the art of reducing leaves to skeletons, which may be done by exposing the leaves to decay for some time soaked in water, by which means the softer parts will be separated from the internal and harder. By carefully wiping, pressing, and rinsing them, the harder parts may be obtained from the rest quite entire. Some have been able to separate the outer covering on both sides from the woody net, and even to split the latter into two. A naturalist in the year 1645 first conceived the idea of making leaf-skeletons by employing decomposition for that purpose, assisting it by several ingenious operations of art. When the method of producing these skeletons was publicly known, numberless preparations of them were everywhere attempted. So much did leaf-skeletons afterwards engage the attention of philosophers, that one Seligmann wrote a treatise on the various methods which might be employed in their preparation.

Leaf, in clocks and watches, is an appellation given to the notches of their pinions.

LEAGUE, a measure of length, containing more or fewer geometrical paces, according to the different usages and customs of countries. A league at sea contains 3000 geometrical paces, or three English miles. The French league sometimes contains the same measure, and sometimes consists of 3500 paces; the mean or common league consists of 2400 paces, and the little league of 2000. The Spanish leagues are larger than the French; seventeen Spanish leagues making a degree, or twenty French leagues, or sixty-nine and a half English statute miles. The Dutch and German leagues contain each four geographical miles. The Persian leagues are pretty nearly of the same extent with the Spanish; that is, they are equal to four Italian miles, which is pretty near what Herodotus calls the length of the Persian parasang, which contained thirty stadia, eight of which, according to Strabo, were equal to a mile. The word comes from *leuca* or *leuga*, an ancient Gaulish word for an itinerary measure, and retained in that sense by the Romans. Some derive the word *leuca* from λευκος, *white*, as the Gauls, in imitation of the Romans, marked the spaces and distances of their roads with white stones.

League also denotes an alliance or confederacy between princes and states for their mutual aid, either in attacking some common enemy, or in defending themselves against one. The word comes from *liga*, which, in the corrupt Latin, was used for a confederacy: *Qua quis cum alio ligatur.*

Leagues, amongst the Greeks, were of three sorts: 1. Σπονδη, Συνθηκη, or Ειρηνη, by which both parties were obliged to cease from hostilities, without molesting the allies of each other; 2. Επιμαχια, by which they engaged to lend assistance to each other in case of invasion; and, 3. Συμμαχια, by which they engaged to have the same friends and enemies, and to assist each other upon all occasions. All these leagues were confirmed with oaths, and imprecations, and sacrifices. The victims most generally sacrificed were a boar, ram, or goat, sometimes all the three; and sometimes bulls and lambs. They cut out the testicles of the animal, and stood upon them whilst they swore; then some of the hair of the victim was distributed to all present; and, lastly, they cut the animal's throat, which was called ὁρκια τεμνειν, in Latin, *ferire fædus.* This being done, they repeated their oaths and imprecations, calling the gods to witness the honesty of their intentions. A libation was then made of wine, which was mixed, to imply their conjunction and union; and whilst this was pouring out, they prayed that the blood of him who should break the treaty might be poured out in like manner. Upon these occasions no part of the victim was eaten. Still further to increase the solemnity of this obligation, the league was engraved upon brass, fixed up in places of public resort, and sometimes read at the solemn games. Some exchanged certain συμβολα, or *tesseræ*, upon the occasion, and frequently sent ambassadors on an appointed day, to keep each other in mind of their engagements.

The League, by way of eminence, denotes that famous one which existed in France from the year 1576 to 1593. Its intention was to prevent the succession to the crown of Henry IV. who was of the reformed religion; and it ended with his abjuration of that faith.

The Leaguers, or confederates, were of three kinds. The *zealous leaguers* aimed at the utter destruction, not only of the Huguenots, but also of the ministry. The *Spanish leaguers* had principally in view the transferring of the crown of France to the king of Spain, or the infanta his daughter. The *moderate leaguers* aimed only at the extirpation of Calvinism, without any alteration of the government.

LEAK, at sea, is a hole in the ship, through which the water comes in. A ship is said to *spring a leak* when she begins to leak, or to let in the water. The manner of stopping a leak is to put into it a plug wrapped in oakum and well tarred, or to insert a tarpawling clout, which keeps out the water, or to nail a piece of sheet-lead on the place. Seamen sometimes stop a leak by thrusting a piece of salt beef into it. The sea-water, says Mr Boyle, being fresher than the brine imbibed by the beef, penetrates into its body, and causes it to swell so as to bear strongly against the edges of the broken plank, and thereby stops the influx of the water. A ready way to find a leak in a ship is to apply the narrower end of a speaking trumpet to the ear, and the other to the side of the ship where the leak is supposed to be; then the noise of the water rushing in at the leak will be distinctly heard, and thereby discovered.

LEAKAGE, the state of a vessel that leaks, or lets in or out water or other liquid.

LEAKE, Richard, was born at Harwich in 1629, and was bred to the sea. At the Restoration, he was made master gunner of the *Princess*, a frigate of fifty guns, and in the first Dutch war distinguished himself by his skill and bravery in two extraordinary actions; one against fifteen sail of Dutch men of war; and another in 1667 against two Danes in the Baltic, in which, the commanding officers of the *Princess* being killed or desperately wounded, the command, according to the rules of war at that time, fell to the gunner. In 1669 he was promoted to be gunner of the *Royal Prince*, a first-rate man of war. He was engaged, with his two sons, Henry and John, in the battle against Van Tromp, in 1673, when the *Royal Prince* had all her masts shot away, nearly 400 of her men killed and disabled, and most of her upper tier of guns dismounted. As she lay thus like a wreck upon the water, a great Dutch man of war came down upon her with two fire-ships, either to burn or carry her off; and Captain, afterwards Sir George Rooke, thinking it impossible to defend her, ordered the men to save their lives, and the colours to be struck. Mr Leake hearing this, ordered the lieutenant off the quarter-deck, and took the command himself, saying, " the *Royal Prince* shall never be given up to the enemy while I am alive to defend her." The undaunted spirit of the brave gunner inspired with resolution the small residue of the ship's company; they returned with alacrity to the fight, and, under the direction of this valiant gunner and his two sons, sunk both the fire-ships, and having obliged the man of war to sheer off, saved the *Royal Prince*, and brought her into Chatham. But Mr Leake's joy in obtaining this victory was damped by the loss of Henry, his eldest son, who was killed near him. Soon afterwards Mr Leake was preferred to the command of a yacht, and also made gunner of Whitehall. In 1677 he obtained a grant for life of the office of master gunner of England, and storekeeper of the ordnance at Woolwich. In this situation he had full scope for his genius. He accordingly, amongst other things, invented the cushee piece; and contrived to fire a mortar by the blast of a piece, which has been used ever since. He was also the principal contriver of what the French call *infernals*, used at the bombardment of St Malo in 1693. Mr Leake had a surprising genius for all inventions of this kind; and had frequent trials of skill with French and Dutch gunners and engineers in Woolwich Warren, at which Charles II. and the Duke of York were often present, and in which he never failed to excel all his competitors. Nor was he less skilled in the art of contriving compositions for fireworks, of which he likewise made frequent trials with equal success.

Leake, *Sir John*, an English admiral, distinguished by his bravery and success, was born in 1656, and taught mathematics and gunnery by Mr Richard Leake, his father, master gunner of England. Having early entered into the navy, he distinguished himself under his father in 1673, in the memorable engagement between Sir Edward Spragg and Van Tromp, when only sixteen years of age; and being afterwards appointed captain, he signalized himself on various occasions, particularly by executing the desperate attempt of convoying some victuallers into Londonderry, which obliged the enemy to raise the siege, and also at the famous battle of La Hogue. In 1702, being made commodore of a squadron, he destroyed the French trade and settlements at Newfoundland, and restored to the English the possession of the whole island. On his return he was created rear-admiral; and soon afterwards he was made vice-admiral of the blue, and knighted. He was engaged with Admiral Rooke in taking Gibraltar; after which he particularly distinguished himself in the general engagement off Malaga, when, commanding the leading squadron of the van, consisting only of six ships, he drove that of the enemy, consisting of thirteen, out of the line of battle, so disabled that they never returned to the fight. In 1705, he relieved Gibraltar, which the French had besieged by sea, and the Spaniards by land, so seasonably, that the enemy was to have attacked the town that very night in several places, and would undoubtedly have made themselves masters of it. Five hundred Spaniards had, by the help of rope-ladders, climbed up the rocks by a way which was thought inaccessible; and at the same time they had got a great number of boats, to land, at the New Mole, three thousand men, who, by making a vigorous assault on the side next the sea, were to draw the garrison to oppose the attack, whilst the five hundred men concealed rushed into the town. The latter being the next day forced by hunger to quit their ambuscade, were discovered; upon which, Sir John assisting the garrison with sailors and marines, they were attacked with such vigour, that, though they had taken an oath not to surrender to the English, a hundred and ninety common soldiers and thirty-five officers accepted quarter, two hundred were killed on the spot, and the rest who endeavoured to make their escape fell headlong down the rock. He was soon afterwards made vice-admiral of the white, and then twice relieved the same fortress. The last time, he attacked five ships of the French fleet coming out of the bay, of which two were taken, and two driven ashore and destroyed. Baron Pointi died soon afterwards of the wounds he received in the battle; and in a few days the enemy raised the siege. In the year 1706, Sir John engaged in the reduction of Barcelona, and next year relieved that city when it was reduced to the last extremity, obliging King Philip to raise the siege. Soon afterwards he took the city of Carthagena, whence he proceeded to Alicant and Joyce, which both submitted to him; and he concluded the exploits of that year with the reduction of the city and island of Majorca. Upon his return home, Prince George of Denmark made him a present of a ring valued at L.400, and he had the honour of receiving L.1000 from the queen as a reward for his services. Upon the unhappy death of Sir Cloudesly Shovel, in 1707, he was made admiral of the white, and commander-in-chief of her majesty's fleet; and the next year, having surprised a convoy of the enemy's corn, he sent it to Barcelona, and thus saved both that city and the confederate army from the danger of famine. He then proceeded to the island of Sardinia, which he reduced to the obedience of King Charles; and soon afterwards assisted Lord Stanhope in the conquest of Minorca. On his return home, he was appointed one of the council to the lord high admiral; and in 1709 he was made rear-admiral of Great Britain. He was several times chosen member of parliament for Rochester; and in 1712 conducted the English forces to take possession of Dunkirk. But upon the accession of King George I. he was superseded, and allowed a pension of L.600 a year. After this he lived privately till his death, which happened at his house in Greenwich in 1720.

Leake, *Stephen Martin*, son of Captain Martin, went through different ranks in the herald's office till he came to be garter king at arms. He was the first person who wrote professedly on our English coins, two editions of his Historical Account of which were published with plates, under the title of *Nummi Britannici Historia*, the first, London, 1726, 8vo; the second, much improved, London, 1745, 8vo. He printed, in 1750, a Life of Sir John Leake, admiral of the fleet, to whom he was indebted for a considerable estate, which the admiral devised to trustees for the use of his son for life, and upon his death to Captain Martin, who had married Lady Leake's sister, and his heirs, by which means it came to the captain's son, who, in gratitude to the memory of Sir John Leake, wrote an account of his life, of which only fifty copies were printed. In 1766, he printed also fifty copies of the statutes of the order of the garter, 4to. He died in 1773, and was buried in the chancel of the parish church of Thorp in Essex.

Leander
‖
Lease.

LEANDER, in poetical history, a young man of Abydos, in Asia. He used to swim across the Hellespont by night to visit Hero, his mistress, who set forth a light to guide him; but in a tempestuous winter night he was drowned; upon which Hero seeing him dead on the shore, cast herself headlong from the tower, and perished.

LEAO, a mineral substance approaching to the nature of lapis lazuli, found in the East Indies, and of great use in the Chinese porcelain manufactures, as it affords the finest blue they are possessed of.

LEAO, a river of Chinese Tartary, which traverses the greater part of the province of Cheng-yang or Leao-tong, and falls into the head of the Gulf of Leao-tong.

LEAO-TONG, GULF OF, a considerable gulf, connected with that of Pe-tche-lee, and extending along the coast of the province of the same name in Chinese Tartary. It is 120 miles in length by eighty in breadth.

LEAP, in *Music*, is when the song does not proceed by conjoint degrees, as in the case where between each note there is an interval of a third, a fourth, a fifth, and the like.

LEAPING, or VAULTING, was an exercise much used both amongst the Greeks and Romans. The former called it ἁλμα, and performed it with weights upon their heads and shoulders. Sometimes they carried the weights in their hands, which were of different figures, but generally oval, and made with holes or covered with thongs, through which the leapers put their fingers. These weights were called ἁλτηρες. The contest was who could leap the highest and farthest. The place whence they jumped was called βατης, and that to which they leaped ἐσκαμμενα, because the ground was there dug up. This exercise was performed in the same manner by the Romans.

LEAR, the name of a British king, said in old chronicles to have succeeded his father Bladud, about the year of the world 3160. The story of this king and his three daughters is well known, from Shakspeare's tragedy founded upon it.

LEARCHUS, a celebrated Greek sculptor of Rhegium, in the south of Italy, who seems to have flourished at a very early period, before 620 B. C. He made a statue of Jupiter in bronze, which was seen at Sparta, and which was regarded as the most ancient work of its kind. It was not of one piece, but was made of pieces worked separately, and fixed to one another by means of nails and large hooks, so that the parts could not be separated. It is this species of work which Quatremère de Quincy has perfectly explained under the name of Sphurelaton in his *Jupiter Olympien.* (Pausanias, iii. 17. See Winckelmann, *Op.* vi. 1, 7.)

LEASE, from the French *leiser, demittere*, to let, in law, a demise, or letting of lands, tenements, or hereditaments, unto another for life, a term of years, or at will, for a rent reserved. A lease is either written, called an *indenture, deed-roll*, or *lease* in writing; or by word of mouth, called *lease parole.*

LEASE and *Release*, a species of conveyance used in the English law, first invented by Serjeant Moore, soon after the statute of uses, and now the most common of any, and therefore not to be shaken; though very great lawyers formerly doubted its validity. A lease, or rather bargain and sale, upon some pecuniary consideration, for one year, is made by the tenant of the freehold to the lessee or bargainee. Now this, without any enrolment, makes the bargainer stand seised to the use of the bargainee, and vests in the bargainee the *use* of the term for a year; and then the statute immediately annexes the *possession*. He therefore, being thus in possession, is capable of receiving a release of the freehold and reversion, which must be made to a tenant in possession; and accordingly, the next day, a release is granted to him. This is held to supply the place of livery of seisin; and so a conveyance by lease and release is said to amount to a feoffment.

LEASH, amongst sportsmen, denotes three creatures of any kind, but chiefly greyhounds, foxes, bucks, and hares. The term *leash* also signifies a line to hold in a hunting dog; and a small long thong of leather, by which a falconer holds his hawk.

LEATHER, the skins of several sorts of beasts dressed and prepared for the use of various manufacturers, whose business it is to apply them to useful purposes.

The manufacture of leather is of great importance in every country; and in Great Britain it ranks third or fourth on the list, being inferior only to those of cotton, wool, and iron, if it be not superior to the latter. Mr M'Culloch estimates the total quantity of all sorts of leather, tanned, tawed, dressed, and curried in this country at about 50,000,000 lbs. which, at one shilling and eight pence per pound, gives L.4,166,000 as the value of the leather only. By the same authority, the value of the finished articles of leather manufacture is estimated at L.12,500,000, the value of the leather being taken at one third that of the goods produced from it; and four millions being deducted for the material, there remain L.8,500,000 as the aggregate amount of profits, wages, and the like. Twenty per cent. being set aside as profit, rent of workshops, and the like, there remains as wages, the sum of L.6,800,000; and supposing those employed as shoemakers, saddlers, glovers, and others, to make at an average L.30 a year each, the entire number of such persons will amount to 226,000. This, however, does not include the tanners, curriers, and other persons employed in dressing the leather; and these being estimated at 28,300, we have a grand total of 254,300 individuals employed in the various departments of the business. "Those who may be inclined to suspect these estimates of exaggeration," says Mr M'Culloch, "would do well to reflect on the value of the shoes annually manufactured. It is generally supposed, that the expenditure upon shoes may be taken, at an average of the whole population, at ten shillings each individual, young and old; which, supposing the population to amount to 16,000,000, would give eight millions for the value of shoes only; but taking the value of the shoes at only 8s. 6d. each individual, it gives L.6,800,000 for the amount. Mr Stevenson supposed that the value of the saddlery, harness, gloves, &c. may be assumed to be at least equal to that of the shoes; but we believe this is too high, and have taken it at L.1,100,000 below the value of the shoes. In estimating the value of the entire manufacture at L.12,500,000, we incline to think that we are as near the mark as it is easy to come in such investigations."

Leather was long subject to a duty of $1\frac{1}{2}$d. per pound, and in 1812 this was doubled. In 1822, however, it was reduced to the former amount, and in 1830 the duties on leather were totally abolished.

Number of Pounds Weight of Leather charged with Duties of Excise in England in 1824–1829.

1824	53,429,539	1827	47,616,316
1825	52,274,957	1828	50,233,689
1826	44,927,216	1829	46,200,843

The quantity annually charged with duty in Scotland during the same period was at an average about 6,000,000 lbs. The quantity of wrought and unwrought leather exported in 1829 amounted to 1,338,937 lbs. of the declared value of L.268,380. The value of the saddlery and harness exported during the same year was L.83,303. Nearly two thirds of the leather exported is sent, principally in the shape of shoes, to the British West-Indian and North-American colonies.

Dyeing of LEATHER, *Skins, &c. Blue* is given by steeping the subject a day in urine and indigo, then boiling it with alum; or it may be given by tempering the indigo with red wine, and washing the skins therewith. *Red* is given by washing the skins, and laying them two hours in galls, then wringing them out, dipping them in a liquor made with ligustrum, alum, and verdigris in water; and, lastly, in a dye made of Brazil wood, boiled with ley. *Purple* is given by wetting the skins with a solution of roche alum in warm water; and, when dry again, rubbing them with the hand with a decoction of logwood in colder water. *Green* is given by smearing the skin with sap-green and alum-water boiled. *Dark green* is also given with steel filings and salammoniac steeped in urine till soft, then smeared over the skin, which is to be dried in the shade. *Sky colour* is given with indigo steeped in boiling water, and the next morning warmed and smeared over the skin. *Yellow*, by smearing the skin over with aloes and linseed oil dissolved and strained, or by infusing it in weld. *Orange colour* is given by smearing with fustic berries boiled in alum-water; or, for a deep orange, with turmeric.

LEAVEN, a piece of sour dough, used to ferment and render light a much larger quantity of dough or paste.

Leaven was strictly forbidden by the law of Moses during the seven days of the passover; and the Jews, in obedience to this law, carefully purified their houses from all leaven, as soon as the vigil of the feast began. Nothing of honey or leaven was to have place in any thing presented to the Lord, upon his altar, during this solemnity. If, during the feast, the least particle of leaven was found in their houses, they imagined that the whole was polluted, for a little leaven leaveneth the whole lump. Leaven, in its figurative sense, signifies the bad passions of envy, and malice, and rancour, which sour the temper, and extend their fermenting influence over the social affections; whereas unleavened bread implies sincerity and truth. It is frequently used for any kind of moral contagion.

LEAVES of Plants. See Leaf.

LEBADEA, or Lebadia, an ancient town of Bœotia, on the borders of Phocis, situated between Helicon and Chæronea, near Coronæa. In it stood the oracle of Jupiter Trophonius, which whoever went to consult descended into a subterraneous gulf.

LEBEDAN, a circle in the Russian province of Tambow, extending from north latitude 52. 37. to 53. 9. and in east longitude from 38. 33. to 40. 13. It contains 1210 square miles, and a population of 67,260 persons. It is chiefly watered by the Don, and is of somewhat more than moderate fertility. The capital is the city of the same name, 680 miles from Petersburg, situated on the river Don. It contains seven churches, 604 houses, and 3540 inhabitants. Long. 39. 3. E. Lat. 53. 5. N.

LEBEDJAN, a circle of the Russian province of Ukraine, extending in north latitude from 50. 20. to 50. 60. and in east longitude from 34. 13. to 34. 59. It contains 1366 square miles, with a population of 136,000 persons, inhabiting two cities, and 218 villages. The capital is a city situated on the river Atschonaja, 945 miles from Petersburg. It contains thirteen churches, all of wood, 1207 houses, and 8971 inhabitants. Long. 34. 35. E. Lat. 50. 30. N.

LEBRIJA, or Lebrixa, a town of Spain, in the province of Andalusia, about three leagues north of Xeres, and on the road by the plain from that city to Seville. It was a plain of great celebrity during the contests between Cæsar and Pompey. It was the head-quarters of the latter, and the place where three Roman knights had formed a conspiracy to desert, with all the cavalry, and join Cæsar, a few days before the decisive battle of Meenda. A Roman camp, near the town, with a magnificent castle in the centre, is still remaining. The lower part is Roman bricks, the upper part is of Moorish erection. It is partly in ruins, but a large portion is converted into a monastery, and the whole has a most imposing effect. The country around is very fertile, abounding in corn, wine, and oil, in the cultivation of which the inhabitants find employment. It contains 6000 inhabitants.

LECCE, a city of the kingdom of Naples, the capital of the province of Otranto. It stands on an extensive and fertile plain between Bari and Otranto, is surrounded with walls, and is the most regular and one of the most beautiful cities of the south of Italy. The great square contains some magnificent edifices, adorned with valuable statues. It is the seat of a bishop, and of the several provincial courts of law. It contains a cathedral and thirty-two churches, twenty-eight religious houses for both sexes, two Latin schools, and a college for nobles. It has a population of 14,100 persons, some of whom are engaged in cotton manufactures from cotton-wool grown in the vicinity, which is of an excellent quality. Good wine and tobacco are also raised around it. Long. 18. 30. E. Lat. 40. 38. N.

LE CROIFIC, a sea-port of France, in the department of the Lower Loire, and arrondissement of Savenay. It is situated on a tongue of land which forms the harbour, and has near it some extensive marshes, on which salt is made. It contains 320 houses, and 2450 inhabitants, who are chiefly employed in the herring and Sardinia fishery. Long. 2. 37. W. Lat. 47. 17. N.

LECTI, beds or couches, were of two kinds amongst the Romans, as being destined to two different uses, viz. to lie upon at entertainments, and to repose upon for nightly rest. The first was called *lecti tricliniares*, the other *lecti cubicularii*.

LECTICA was a litter or vehicle in which the Romans were carried. It was of two kinds, covered and uncovered. The covered *lectica* is called by Pliny *cubiculum viatorum*, a traveller's bed-chamber. And indeed we are informed that Augustus frequently ordered his servants to stop his litter that he might sleep upon the road. This vehicle was carried by six or eight men called *lecticarii*. The *lectica* differed from the *sella* in this, that in the one the traveller could recline himself for sleep, whereas in the other he was obliged to sit. The *lectica* was invented in Bithynia; the *sella* was a Roman machine, and esteemed the more honourable of the two. *Lectica* was also the name of the funeral bed or bier for carrying out the dead.

LECTICARII, amongst the Romans, servants who carried the *lectica*.

LECTICARIUS was also an officer in the Greek church, whose business it was to bear off the bodies of those who had died, and to bury them. They were otherwise denominated *decani* and *copiatæ*.

LECTISTERNIUM, a solemn ceremony observed by the Romans in times of public danger, when an entertainment was prepared with great magnificence, and served up in the temples. The gods were invited to partake of the good cheer, and their statues were placed upon couches round the table, in the same manner as men used to sit at meat. The first *lectisternium* held at Rome was in honour of Apollo, Latona, Diana, Hercules, Mercury, and Neptune, to put a stop to a contagious distemper which raged amongst the cattle, in the year of Rome 354. At these feasts the Epulones presided, and the sacred banquet was called *epulum*. Something like the *lectisternium* was occasionally observed amongst the Greeks, according to Casaubon.

LECTORES, amongst the Romans, servants in great men's houses, who were employed in reading whilst their masters were at supper. They were called by the Greeks *Anagnostæ*.

LECTOURE, an arrondissement of the department of Gers, in France. It extends over 427 square miles, comprehends five cantons, divided into ninety-three communes, and contains 58,500 inhabitants. The capital, the city of the same name, is situated on a hill, at the foot of which the Gers flows. It contains 940 houses, and 6600 inhabitants, who tan leather, and carry on considerable traffic in wine and brandy. Long. 0. 31. 48. E. Lat. 43. 56. 2. N.

LECTURERS, in England, are an order of preachers in parish churches, distinct from the rector, vicar, and curate. They are chosen by the vestry, or chief inhabitants of the parish, supported by voluntary subscriptions and legacies, and are usually the afternoon preachers in the Sunday service.

LEDA, in fabulous history, a daughter of Thespius and Eurythemis, who married Tyndarus, king of Sparta. She was seen by Jupiter bathing in the river Eurotas when she was some few days advanced in her pregnancy, and the god, struck with her beauty, resolved to deceive her. He persuaded Venus to change herself into an eagle, whilst he assumed the form of a swan; and after this metamorphosis, Jupiter, as if fearful of the tyrannical cruelty of the bird of prey, fled through the air into the arms of Leda, who willingly sheltered the trembling swan from the assaults of his superior enemy. The caresses with which the naked Leda received the swan enabled Jupiter to avail himself of his situation, and nine months after this adventure the wife of Tyndarus brought forth two eggs, from one of which sprung Pollux and Helena, and from the other Castor and Clytemnestra. The two former were deemed the offspring of Jupiter, and the latter were claimed by Tyndarus. Some mythologists attribute this amour to Nemesis, and not to Leda; and they further mention, that Leda was intrusted with the education of the children which sprung from the eggs brought forth by Nemesis. To reconcile this diversity of opinions, others maintain that Leda received the name of Nemesis after her death. Homer and Hesiod make no mention of the metamorphosis of Jupiter into a swan, and hence some have imagined that the fable was unknown to these ancient poets, and probably invented since their age.

LEDBURY, a market-town of Herefordshire, in the hundred of Radlow, 121 miles from London, not far from the foot of the Malvern Hills. It is situated on the river Leden, and on the side of a canal from Gloucester to Hereford. There are some remains of a woollen manufacture, which was formerly considerable. The market is held on Tuesday. The population amounted in 1801 to 3058, in 1811 to 3136, in 1821 to 3421, and in 1831 to 3852.

LEDGER, the principal book in which merchants enter their accounts. See BOOK-KEEPING.

LEE, an epithet used by seamen to distinguish that part of the hemisphere to which the wind is directed, from the other part whence it blows, and which is accordingly called *to windward*. This expression is chiefly used when the wind crosses the line of a ship's course, so that all on one side of her is called *to windward*, and all on the other side *to leeward*. Hence,

Under the LEE, implies farther to the leeward, or farther from that part of the horizon whence the wind blows.

Under the LEE *of the shore*, means at a short distance from the shore which lies to windward. This phrase is commonly understood to express the situation of a vessel anchored, or sailing under the weather-shore, where there is always smoother water, and less danger of heavy seas, than at a great distance from it.

LEE *Lurches*, the sudden and violent rolls which a ship often takes to the leeward in a high sea, particularly when a large wave strikes her on the weather-side.

LEE-*Side*, all that part of a ship or boat which lies between the mast and the side farthest from the direction of the wind; or otherwise, that half of a ship which is pressed down towards the water by the effort of the sails, as separated from the other half by a line drawn through the middle of her length. That part of the ship which lies to windward of this line is accordingly called the *weather-side*. Thus, admit a ship to be sailing southward, with the wind at east, then is her starboard or right side the *lee-side*, and the larboard or left the *weather-side*.

LEE, NATHANIEL, a dramatic poet of the eighteenth century, was the son of a clergyman, who gave him a liberal education. He received the rudiments of learning at Westminster School, from which he went to Trinity College, Cambridge. Coming to London, however, his inclination prompted him to appear on the stage; but he was not more successful in representing the thoughts of other men than many a genius besides, who has been equally unfortunate in treading the stage, although he perhaps knew well enough how to write for it. He produced eleven tragedies, all of which contain a very great portion of true poetical enthusiasm. His Rival Queens, his Theodocius, and his Alexander the Great, are those which longest kept possession of the stage. None, perhaps, ever felt the passion of love more truly, nor could any one describe it with more tenderness. Addison commends his genius highly, observing, that none of our English poets had a happier turn for tragedy, although his natural fire and unbridled impetuosity hurried him beyond all bounds of probability, and sometimes were quite out of nature. The truth is, this poet's imagination ran away with his reason; so that he at length became quite crazy, and grew so mad that his friends were obliged to confine him in bedlam. Here he made the famous reply to a coxcomb scribbler, who had the cruelty to jeer him with his misfortune, by observing that it was an easy thing to write like a madman. "No," said Lee, "it is not an easy thing to write like a madman; but it is very easy to write like a fool." Lee had the good fortune to recover the use of his reason so far as to be discharged from his melancholy confinement; but he did not long survive his enlargement, and died at the early age of thirty-four. Cibber, in his Lives of the Poets, states that he perished unfortunately in a night ramble in London streets.

LEECHES, in a ship, the borders or edges of a sail, which are either sloping or perpendicular.

The leeches of all sails, the tops and bottoms of which are parallel to the deck, or at right angles to the mast, are denominated from the ship's side, and the sail to which they belong; as the starboard leech of the main-sail, the lee leech of the fore-top-sail, and so on. But the sails which are fixed obliquely on the masts have their leeches named from their situation with respect to the ship's length; as the fore-leech of the mizen, the after-leech of the jib or fore-stay sail, and the like.

Leech-Lines, certain ropes fastened to the middle of the leeches of the main-sail and fore-sail, and communicating with blocks under the opposite sides of the top, whence they pass downwards to the deck, and serve to truss up those sails to the yard as occasion requires.

Leech-Rope, a name given to that part of the bolt-rope to which the border or skirt of a sail is sewed. In all sails, the opposite leeches of which are of the same length, it is terminated above the earing, and below the clue.

LEEDS, in the west riding of Yorkshire, the metropolis of the woollen manufacture, is the fifth town in England in point of population and commercial activity, being only exceeded in these respects by London, Manchester, Liverpool, and Birmingham. The population of the parish and borough, which are co-extensive, amounted, by the census of 1831, to 123,393. The progressive rapidity with which this flourishing place has increased within the present century, is shewn by the decennial enumerations of the inhabitants, which are as follows:—In 1801, the population of the borough was 53,162; in 1811, it was 62,534; in 1821, it was 83,796; and in 1831, it was 123,393. The borough and parish of Leeds are, however, very extensive, measuring, in their longest diameter, not less than seven miles, and in circumference thirty; covering 21,450 acres; and comprising, besides the town and township, ten out-townships, several of which are populous villages, nearly all engaged in the manufacture of woollen cloth. The population of the township of Leeds, that is, of the town, in 1831, was 71,602; and of the out-townships as follows:—Hunslet, 12,074; Holbeck, 11,210; Bramley, 7039; Wortley, 5944; Armley, 5159; Headingley-with-Burley, 3849; Beeston, 2128; Chapel Allerton, 1934; Farnley, 1591; Potternewton, 863. The first two of these out-townships, Hunslet and Holbeck, may strictly be called suburbs of the town, and therefore the population of the town may be considered as 94,886.

Leeds is situated nearly in the centre of the West Riding, in the wapentake of Skyrack, and in the pleasant and well-cultivated valley of the Aire. The surrounding country possesses much cheerful beauty, of which one indication is furnished by the fact, that the Abbey of Kirkstall, one of the grandest monastic structures in the kingdom, and of which the remains are highly picturesque, was built in the same valley, within three miles of the town. The soil is moderately fertile, and the country is not deficient in wood. For manufacturing and commercial purposes, the situation of Leeds is highly advantageous. Placed within a short distance of the great line of road from the metropolis to Scotland, betwixt the two ports of Liverpool and Hull, both exceedingly favourable for foreign trade, and on a navigable river emptying itself into the Humber, its facilities for internal and foreign traffic can scarcely be surpassed. But in its vicinity to large and productive coal-fields and iron-mines, it possesses still higher requisites for manufacturing prosperity. Coal, water, and iron, are the three grand sources of success in manufactures, because they afford all that is needed for the making and working of machinery. This combination of advantages exists in an eminent degree in Leeds, and in the woollen district of Yorkshire. The productive coal-pits of Middleton are within three miles of the town, and the coals are brought to Leeds by a private railway belonging to the proprietor of the pits, Mr Brandling.

Though regarded as the capital town of this great manufacturing district, Leeds is not in its centre, but on its border. Eastward and northward of Leeds, the country is wholly agricultural; westward and to the south-west, in all the valleys and on all the hills betwixt that town and the long and high range that separates Yorkshire from Lancashire, the populous towns and villages resound with the steam-engine and the shuttle, and are daily, save on the Sabbath, canopied by their self-created clouds of smoke. In this district are carried on, a woollen manufacture of great extent and of some antiquity; a worsted stuff manufacture, a modern and vigorous graft on the former; fancy manufactures, of which the raw materials are wool, cotton, and silk; the spinning of flax; and the weaving of linen. The manufactures of Leeds itself are principally that of woollen cloth, the spinning of flax to a great extent, and of worsted to a smaller extent, and one branch of the worsted stuff manufacture; but its merchants also buy extensively the woollen and stuff goods made in the neighbouring towns and villages, and get them finished and dyed; so that Leeds is a general mart for all these fabrics. The operatives in all the branches of manufacture and trade, except the stuff weavers, earn good wages, and thus have the means of great comfort.

The cloth markets of Leeds, held every Tuesday and Saturday, are attended by several hundreds of clothiers from the surrounding villages to a distance of about ten miles. Most of these clothiers are small freeholders, possessing capital enough to keep a few looms at work in their own houses or an adjoining workshop, and often labouring themselves, and employing their families, in weaving. They purchase their own wool, get it dyed at Leeds or elsewhere, and scribbled and slubbed at the mills which perform those processes for hire; they then spin it by means of the jenny, and weave the cloth, which they bring in an undressed state to the Leeds cloth-halls, where it is bought by the merchants, and is afterwards dressed and finished in the mills of that town. From twelve to twenty years since, this system of domestic manufacture seemed in danger of extinction, from the successful rivalry of the factory system. The large manufacturers having, a few years before that time, succeeded, by gig-mills and dressing machinery, in taking the finishing department out of the hands of the croppers, thought they could, with equal advantage, carry on the spinning and weaving in their large establishments, and thus perform every part of the manufacture within the same building, from the sorting of the wool to the turning out of the superfine cloth ready for the draper or tailor. This change was not occasioned by the application of steam-power to the moving of the looms, for the power-loom was then only used in one or two woollen mills; but was recommended chiefly by the advantage of having the cloth made under the eye of the merchant-manufacturer, who expected thus to be able to adapt his fabrics more exactly to the wants of his customers, to command a better cloth, and to obtain for himself the profit of spinning the yarn and making the cloth, as well as of the early and the finishing processes. With this view, extensive weaving shops were attached to most of the mills; and mule-jennies driven by power were substituted for the jennies of the domestic manufacturers. The calculations of the mill-owners were, however, disappointed. The spinning department succeeded, but not so the weaving. They found it necessary, even in the ordinary state of things, to pay higher wages for weaving in the towns than were paid in the country; and the trades' unions formed amongst the weavers in these large establishments, forced up wages still higher, so as to make it more expensive to the great manufacturers to make the cloth than to buy it of the domestic clothier. In consequence of this, and of the extreme annoyance given by the trades' unions to the masters, many of the leading houses either wholly or partially abandoned the weaving; and the village clothiers, who had been threatened with ruin, regained their trade, and are now enjoying much prosperity. If, however, the power-loom should continue to gain ground as it has done within the last two or three years, and it should appear that woollen cloth can be manufactured better or cheaper by that machine than by the hand-loom, another change must take place, and the town of Leeds will then probably take away much of the weaving from the villages.

The Leeds cloth-halls, of which there are two, one for the sale of coloured cloths, and one for white cloths only, form an interesting spectacle on the market days. They are very large plain structures, not divided into rooms, but forming covered galleries or streets of great length, simply fitted up with low stands or benches along each side of the street, on which the clothiers place their cloth; and leaving an aisle of about two yards in width down the centre, along which the merchants walk, to examine the pieces exposed for sale, and make their bargains. The cloth-halls are under the management of trustees chosen by the clothiers, one or two from each considerable village, and each clothier purchases one or more stands. The market opens, at a certain fixed hour, on the mornings of Tuesday and Saturday, and is kept open only about an hour and a half, during which period all the business of buying and selling is transacted. Punctuality and despatch are of course requisite. At the appointed hour of commencement, the clothiers are ranged behind their stands, and the merchants enter the hall. When the latter find such pieces of cloth as they require, the price is inquired, and, if a bargain should be struck, a slight memorandum of price and quantity is made on the spot; the cloth is left, and the clothier afterwards takes it to the merchant's warehouse, to be measured and more carefully examined. In this way goods of the value of many thousand pounds are sold each market-day within a very short time. The hour of closing the market is rigidly enforced, by a fine of five shillings being levied on any merchant remaining in the hall five minutes after the ringing of a bell. The remainder of the day is generally spent by the clothier in delivering his goods, in attending their measurement and examination, in receiving payment, in buying of the woolstapler a fresh stock of the raw material, and in making his arrangements with the dyer and the mill-owner for dyeing and scribbling the wool. The coloured cloth-hall was built in the year 1758; it forms a great quadrangle, inclosing an area of the same shape. The longer sides of the quadrangle are 128 yards in length, and the shorter sixty-six yards, and it contains 1800 stands. The white cloth-hall was built in 1775; it is nearly of the same extent as the other hall, and contains 1210 stands. The market in the white cloth-hall commences after that in the coloured-cloth-hall is over, so as to allow the merchants an opportunity of attending both. Before the erection of these halls, the cloth-market was held in the long street called Briggate, and on the bridge.

The woollen-cloths of Leeds and Yorkshire are confessedly inferior to those of the West of England. About twenty years since, a great improvement in the manufacture and finishing of cloth was made by Mr William Hirst, of Leeds, whose manufacture was at least equal to that of the West of England; and he was able to command a high price for his goods. His success and that of others shew that as good cloth may be made in Yorkshire as in Gloucestershire and Wiltshire. But the Yorkshire manufacturers having been habituated to make an inferior article, and to sell it at a lower price, they do not readily abandon their old habits. In cloths of the lower qualities they are unrivalled, and these constitute the great bulk of their production. The example of a few manufacturers of capital, intelligence, and spirit, and adding to the qualities, which are already possessed by many of the Yorkshire manufacturers, a determination to use the best materials, and to turn out the best fabrics, would probably regain for that county a reputation for superfine cloths. The largest woollen mills in Leeds are those of the wealthy firm of Benjamin Gott and Sons.

The spinning of flax by machinery was commenced in Leeds, or the neighbourhood, nearly fifty years since, by Mr John Marshall, who, though not the first, was one of the first to apply the principle of Sir Richard Arkwright's water-frame, invented in the cotton-manufacture, to the spinning of linen yarn. After a doubtful struggle with the difficulties that presented themselves, Mr Marshall's talent, boldness, and perseverance at length triumphed, and he established a trade which has raised him from very moderate circumstances to the possession of immense wealth, and has made him a great benefactor to his native town. That gentleman represented the county of York in Parliament from 1826 to 1830, and his second son has represented the borough of Leeds in one Parliament. The flax-mills of Messrs Marshall and Sons, in the township of Holbeck, are very extensive, employing 1300 work-people. Several other flax-mills have also been established in Leeds, most of them by gentlemen who were originally in the employment of Messrs Marshall. The business has succeeded to a great extent, and now employs about six thousand hands, with excellent profit to the capitalists, and good wages to the workmen.

The spinning of worsted yarn, and the weaving of worsted stuffs by power-looms, are successfully carried on by a few houses in Leeds, and these branches seem likely to be extended, though they belong more peculiarly to Bradford. There is also in Leeds a branch of the worsted-stuff manufacture, consisting of the weaving of camlets and low stuffs, employing about a thousand looms, the weavers being for the most part Irish. The mercantile department of the stuff-trade is largely prosecuted; and the merchants buy their goods, in the grey or unfinished state, at the Bradford market, and have them dyed and finished at Leeds. There is an establishment in this town for the spinning of waste silk.

Where several manufactures are carried on to a great extent, there must of course be many machine-makers; and this, accordingly, is a flourishing business in Leeds. Steam-engines, of excellent quality, are made by the firm of Fenton, Murray, and Jackson. The woollen and stuff dyers also form a rather numerous class in this industrious community; and the trades of the wool-stapler, the drysalter, and the oil-merchant, employ considerable capitals.

The following statements are from the returns of Mr Baker, the superintendent of factories, at the close of the year 1835:—

Number of Persons employed in Mills in the Borough of Leeds.

Woollen.	Flax.	Worsted.	Silk.
9312	5926	1420	153

Number of Power-Looms in the Borough of Leeds.

Woollen.	Worsted.
213	818

It should be observed, that the above numbers by no means shew the proportional importance of the woollen and flax trades in Leeds. Flax being only spun, and no linens woven, in Leeds, all the processes are performed in the mills, and all the hands employed are shewn in the above returns. But not so in the woollen manufacture. Most of the weavers work in their own houses, or small work-shops; some branches of the finishing are not performed in the mills; and the establishments of the dyers, woolstaplers, &c. are also separate.

By the Leeds and Liverpool Canal, Leeds has a water communication with the Western Sea; and by the river Aire, and the canals formed in connection with it by the Aire and Calder Navigation Company, vessels of considerable burden come up from the Humber to Leeds. The water communication with the ports of Hull, Goole, and London, and with other parts of the United Kingdom and the north of Europe, is therefore good. Still further to facilitate the transport of goods and passengers, a railway of twenty-one miles in length has been formed from Leeds to Selby, a town on the river Ouse, to which steam-packets come daily from Hull. This railway was opened in September 1834; it is well constructed, and is paying a fair interest to the proprietors. It will, however, be more useful and prosperous when the projected railway from Hull to Selby shall be made. A bill for this undertaking is now (1836) before Parliament, and when the work shall be completed, the journey from Leeds to Hull will be performed in less than three hours, which will at once be advantageous to the commerce of Hull, and to the manufactures of Yorkshire and Lancashire. A railway is also projected between Manchester and Leeds; and when this shall be made, as well as that from Hull to Selby, a railway communication will be completed across the island, from Liverpool to Hull, through the heart of the greatest cotton and woollen manufactures in the world. The prosperity of those districts must necessarily be increased by the extraordinary facilities that will thus be given to foreign and inland traffic. The capitalists of Leeds being alive to the importance of this new mode of conveyance, a railway has been planned from Leeds to Derby, called the North Midland Railway, and the bill is now (1836) before Parliament. By this line, in connexion with the London and Birmingham Railway, now in course of formation, and either the Midland Counties or the Derby and Birmingham Railway, both projected, a direct communication will be opened from Leeds to the metropolis, and to the centre and west of England, as well as to Wakefield, Barnsley, Sheffield, Derby, Nottingham, and Leicester. It is also more than probable that a railway will shortly be constructed from Leeds northwards to Durham, Newcastle, Edinburgh, and Glasgow. This town will then enjoy every advantage that can be given by the most rapid communication with all parts of Great Britain.

Leeds is an ancient town, but has been the scene of no historical events. It was probably a Roman station. The ancient name, *Loidis*, is Saxon, being derived either from *Loid*, a people, or from the proper name of one of its Saxon possessors. In the time of William the Conqueror it appears to have had a very small population. The following is the record of Domesday Book: "In Ledes, ten carucates of land and six oxgangs to be taxed. Land to six ploughs. Seven thanes held it in the time of King Edward for seven manors. Twenty-seven villanes, and four sokemen, and four bordars, have now there fourteen ploughs. There is a priest and a church, and a mill of four shillings and ten acres of meadow. It has been valued at six pounds, now seven pounds." After the Conquest, Leeds belonged to Ilbert de Lacy, by whom it seems to have been granted to the Paganels; and in the reign of John, by which time the town had risen into some consequence, Maurice Paganel granted a charter to the burgesses. A castle of considerable strength, called "famous" by the historian Thoresby, existed here in the reign of Stephen, by whom it was besieged in 1139 on his march to Scotland; and Richard II. was confined in it in 1399, before being committed to Pontefract Castle, the scene of his murder. Every trace of the castle has long since disappeared, and the site of the park attached to it is only known from the names of the streets which have been built upon it. A survey taken in the reign of Edward III. shews that the woollen-trade already existed here, as "fulling-mills" are mentioned; so that Leeds must have been one of the oldest seats of the woollen manufacture in England. Its trade seems, however, to have languished, for Leland thus speaks of it in the reign of Henry VIII. "Ledes, two miles lower down than Christal Abbay, on Aire river, is a praty market toune, subsisting chiefly by clothing, having one paroche church, reasonably well builded, and as large as Bradeford, but not so quik as it." At that day, also, Wakefield was larger than Leeds; but the latter place subsequently increased far beyond all the neighbouring towns. Charles I. gave a charter to the borough, under which Sir John Savile, of Howley-hall, from whom several noble families are descended, was the first honorary alderman. The arms of the town bear testimony to this connexion with the Saviles, as two crowned owls, or *hullarts*, the arms of that family, were added to the golden fleece, the appropriate ensign of this seat of the woollen manufacture. Another charter was given to Leeds by Charles II. in 1661, under which a corporation was formed, consisting of a mayor, twelve aldermen, and twenty-four assistants. This charter, though taken away by James II., was restored by William and Mary, and continued in existence till the general reform of the municipal corporations of England by the act of 5th and 6th William IV, c. 76, which has given to Leeds, instead of a close and self-elected body for the government of the borough, a representative body consisting of sixteen aldermen and forty-eight councillors. The charter of Charles II. had, for its principal object, the making of municipal laws and regulations to protect the staple manufacture from "abuses, defects, and deceits in the making, selling, and dyeing of woollen cloths." The trade, however, was allowed a happy degree of liberty; no restrictions were placed on settling in the town, or carrying on any business; the corporation, having no property, and little political influence, (seeing that the borough did not return members to Parliament,) remained free from the abuses which stained many other corporations, and simply presided over the police, doing otherwise neither good nor harm. During the Commonwealth, Leeds returned one representative, Captain Adam Baynes, of Knostrop; but on the Restoration that privilege was taken away, and this borough was one of those great and flourishing places, the non-representation of which formed so irresistible an argument for the reform of the House of Commons. By the reform act, Leeds received two representatives. One of its first members was the eloquent Thomas Babington Macaulay, since appointed a member of the supreme council in India; and the other Mr John Marshall jun. It is now represented by Sir John Beckett, formerly Judge-Advocate under Tory administrations, and by Mr Edward Baines, the proprietor, and for many years the editor, of the *Leeds Mercury*, the most extensively circulated, and perhaps the most influential of the English provincial newspapers, now conducted by his son, who is also the author of a History of the Cotton Manufacture.

Leeds has a parish church of great antiquity, but not very remarkable either for its architecture or its monuments. The town has, besides, seven churches (not reckoning those in the out-townships), and numerous chapels belonging to the Methodists, Independents, Baptists, and Unitarians. The Dissenters are a very large body in Leeds; intelligent, active, and influential. There are perhaps few towns of equal size where the moral and religious feeling is stronger, or where there is greater sobriety of temper amongst the inhabitants. The latter characteristic is indicated by the absence of any undue degree of speculation in trade, by popular riots or commotions being almost unknown, and by the temperate and judicious, though decided and influential, part which this town has taken in promoting the cause of civil and religious liberty, and of reform in the national institutions.

Leeds is irregularly built, having no police regulations to enforce any thing like uniformity in building. It has few attractions for the stranger. Yet some of its structures are handsome, and there is a spirit of improvement, which is likely ultimately to remove many of the present defects, and to ornament the town. The Court-house, of the date of 1815, is a handsome stone edifice; and the Commercial Buildings are still more elegant. The town has several commodious markets, an excellent suite of public baths, a good music-hall, and a miserable theatre. Its waterworks are shamefully defective, but new works are contemplated. The town is well lighted by two gas companies. Cavalry barracks were erected a few years since at one of the outskirts. The savings bank is well supported. The charities of Leeds are considerable; several of them, including the free grammar-school, the hospital or almshouses, &c. were either founded or endowed by a munificent public benefactor, Mr John Harrison, who lived in the early part of the seventeenth century, and who also built and endowed St John's Church. Of modern date, are a spacious and well-managed infirmary, a house of recovery for fever patients, a dispensary, a guardian asylum, a lying-in charity, a benevolent or strangers' friend society, Lancasterian and National schools, an infant school, &c. The literary and scientific institutions of the town are very respectable. The Philosophical and Literary Society, founded in 1820, has a good museum, and its building is elegant, though plain. A literary institution, a mechanics' institution, and subscription libraries also exist in the town. A medical school has lately been established, and is supported with talent and success by the physicians and surgeons, so that it has attained some reputation, and its lectures are admitted by the College of Surgeons and the Apothecaries' Company as qualifying the pupils for entering on the profession. The present number of pupils is from forty to fifty. A very elegant and beautiful cemetery, covering nine acres of ground, was constructed in the year 1835, in an elevated situation near the town; and this burial-place, so desirable an appendage to a large town, is likely to be generally used by the inhabitants.

The history of Leeds has been written by two antiquarians,—Ralph Thoresby, F. R. S., a learned and pious native of the town, who published his *Ducatus Leodiensis* in 1714, and the Rev. Thomas Dunham Whitaker, LL. D., F. S. A., who re-published Thoresby's work, and added another volume, under the title of *Loidis and Elmete*, in 1816. The latter work deserves high praise for its ability and antiquarian learning, but it is miserably defective in its notice of the manufactures and trade of the place, and treats them with the most prejudiced contempt. Leeds was the native place of Dr David Hartley, the pupil of Sir Isaac Newton, and author of "Observations on Man:" he was the son of a clergyman at Armley. General Guest, the commander of the King's troops at Edinburgh in 1745, was the son of a Leeds cloth-dresser. Mr John Smeaton, the celebrated engineer, and the architect of Eddystone light-house, was born at Austhorp, in this parish, where his family still reside. Benjamin Wilson, the eminent painter, who flourished about the middle of the last century, was a native of Leeds. The Rev. Joseph Priestley, LL. D., the distinguished philosopher, was born at Bristol, within eight miles of Leeds, and officiated for several years as the minister of the Unitarian Chapel in this town; and during his residence here, a select literary society was formed, of which the Doctor and the late William Hey, F. R. S., an eminent surgeon and a Christian philanthropist, were the most active members: they met for the purpose of philosophical enquiry and experiment. The Leeds Subscription Library originated in the suggestion of Dr Priestley. Leeds gives a ducal title to the family of Osborne, which sprung from this town. Edward Osborne, in the reign of Henry VIII., went from Leeds to be apprenticed to Sir William Hewet, Lord Mayor of London; and having plunged into the Thames to save the life of his master's only daughter, who had fallen into the river from their house on London Bridge, he was appropriately rewarded for his gallantry with the lady's hand. He himself became Lord Mayor of London; and his descendant, Sir Thomas Osborne, Bart., became the celebrated Earl of Danby and Duke of Leeds, and was president of the council in 1689. Leeds is distant 190 miles from London, and 24 from York.

LEEFOGA, one of the smallest of the Hapaee Islands, in the South Pacific Ocean. It is not above seven miles long, and in some places not above two or three broad. There is a reef running to a considerable extent from the east end of it, on which, from being exposed to the trade-winds, the sea breaks with great violence. It was here that in 1800 the *Port-au-Prince* privateer was cut off, and almost all the crew massacred. Long. 185. 40. E. Lat. 12. 49. S.

LEEK, a market-town and parish of the hundred of Totmonslow, in the county of Stafford, 154 miles from London. It is in the neighbourhood of coal mines, which have given rise to manufactures. The making of an inferior description of ribbons has been long a source of employment, and has latterly been extended by the removal of the duty on raw silk. There is a well-supplied market on Wednesday. The population within the town amounted in 1801 to 3489, in 1811 to 3703, in 1821 to 4855, and in 1831 to 6374; but the whole parish, at the latter census, contained 10,780 inhabitants.

LEER, in glass-making. See Glass.

LEER, a city of the province of East Friesland, in the kingdom of Hanover, the capital of a bailiwick of the same name. It is situated on the river Leda, near its junction with the Ems, and is a well-built town, containing three churches, a synagogue, 739 houses, and 5514 inhabitants. It is a place of active trade in corn, with extensive distilleries and breweries, several oil-mills, and fabrics of linen, soap, and leather. The harbour is adapted for vessels not exceeding 150 tons. Long. 7. 20. 10. E. Lat. 53. 13. 43. N.

LEES, the grossest and most ponderous parts of liquors, which, being separated by fermentation, fall to the bottom. The word comes from the French *lie;* and that either from *limus*, mud, or from *Lyæus*, one of the surnames of Bacchus; or, according to Du Cange, from *lia*, a corrupt Latin word signifying the same thing. The vinegar-makers carry on a great trade in the lees of wine dried and made into cakes, after having squeezed out the remains of the liquor in presses.

LEETAKOO, or Lattakoo, the capital of the Boshuana territory, in Southern Africa. The old town of this name, when first visited in 1801, contained from 10,000 to 15,000 inhabitants, who had made some advancement in the arts of civilized life; but in consequence of a schism in one of the tribes, the inhabitants removed to a place about sixty miles farther north. New Leetakoo is supposed to contain about 6000 people.

LEEUWARDEN, a city, the capital of the province of Friesland, in the Netherlands, and of the circle of the same name in that province, which contains ten cantons, with 95,000 inhabitants. The city is situated on a canal which proceeds to Dockum, is well built, with clean, wide streets, intersected by several canals. The chief edifices are the stadthouse and the palace of Orange. It is fortified, and contains 1900 houses, with a population (in 1830) of 20,938 persons, viz. 9857 males, and 11,081 females. It has a considerable trade in making linen goods, paper, and cloth, and is the great market for Friesland horses. Long. 5. 54. E. Lat. 53. 17. N.

Leeward Ship signifies a vessel that falls much to leeward of her course when sailing close-hauled, and consequently loses much ground.

To Leeward, towards that part of the horizon which lies under the lee, or whither the wind blows. Thus, "We saw a fleet *under the lee*," and, "We saw a fleet *to leeward*," are synonymous expressions.

LEGATE, a cardinal or bishop, whom the pope sends as his ambassador to sovereign princes. There are three kinds of legates, viz. legates *a latere*, legates *de latere*, and legates by office, or *legati nati*. Of these, the most considerable are the legates *a latere;* the next are the legates *de latere*. Legates by office are those who have not any particular legation given them, but who, by virtue of their dignity and rank in the church, become legates. Such are the archbishops of Rheims and Arles; but the authority of these legates is much inferior to that of the legates *a latere*.

The term *legate* comes from *legatus*, which Varro derives from *legere*, to choose, and others from *legare*, *delegare*, to send, to delegate.

Court of the Legate was a court obtained by Cardinal Wolsey from Pope Leo X. in the ninth year of Henry VIII. in which he, as legate of the pope, had power to prove wills, and dispense with offences against the spiritual laws. It was but of short continuance.

LEGATUS, a military officer amongst the Romans, who acted as deputy of the commander-in-chief. The *legati*, at their first institution, were appointed not so much to command as to advise; and they were generally chosen by the consuls, with the approbation of the senate. As to the number of the *legati* we have no certain information, though we may upon good grounds assign one to every legion. In the absence of the consul or proconsul, they had the honour of the *fasces*. Under the emperors there were two sorts of *legati*, *consulares* and *prætorii*. The former commanded whole armies, as the emperor's lieutenants-general; the latter had the command of particular legions. The *legati* under the proconsuls in the provinces served for judging inferior causes, managing smaller concerns, and remitting things of great moment to the governor or president himself. This, as above hinted, was originally the duty of the *legati*, though, as we have also seen, they were afterwards admitted to command in the army.

LEGEND, any idle or marvellous story told concerning saints, and other persons.

The legend was originally a book used in the churches, containing the lessons to be read at divine service; and hence the lives of the saints and martyrs came to be called *legends*, because chapters were read out of them at matins, and in the refectories of religious houses. Amongst these, the golden legend, which is a collection of the lives of the saints, was received with great applause in the church, where it maintained its ground for two hundred years; though it is so full of ridiculous and romantic stories, that the Romanists themselves are now ashamed of it.

Legend is also used by authors to signify the letters or words which are engraved round the margins and other parts of coins.

Legend is likewise applied to the inscription of medals, which serves to explain the figures or devices represented on them. In strictness, the legend differs from the inscription, which properly signifies words placed upon the reverse of a medal, instead of figures.

It seems as if the ancients had intended their medals to serve both as images and as emblems; the former for the common people, and the latter for persons of taste and parts; the images to represent the faces of princes, and the emblems their virtues and great actions. Hence the legend is to be looked upon as the soul of the medal, and the figures as only the body.

Every medal has properly two legends; that upon the front, and that upon the reverse. The former generally serves to distinguish the person by his name, titles, offices, and the like; the latter is intended to express his noble and virtuous sentiments, his good deeds, and the advantages which the public has reaped from them. This, however, does not hold universally; for we sometimes find the titles shared between both sides, and sometimes also the legend.

In the medals of cities and provinces, as the head usually represents the genius of the place, or at least some deity adored there, the legend contains the name of the city, province, or deity, or of both together; whilst on the reverse is some symbol of the city, frequently without a legend, sometimes with that of one of its magistrates.

LEGERDEMAIN, a denomination given to certain deceptive performances, which either depend altogether on dexterity and address, or derive but a small degree of aid from philosophical principles.

LEGER Line, in *Music*, one added to the staff of five lines, when the ascending or descending notes run very high or very low. There are sometimes many of these lines both above and below the staff.

LEGHORN, properly Livorno, a commercial city of the duchy of Tuscany, in Italy. It stands on the sea-shore, near the island of Melora, which, by its castle, defends the entrance of the harbour. It is surrounded by strong walls on every side; but towards the land these are thought to be untenable, from being commanded by neighbouring heights. The outer harbour has not depth of water for ships of more than 400 tons burden. It is surrounded by a long mole, the efficiency of which is lessened by the great quantity of sand brought in by the west and the north winds. The inner harbour, called Darsena, is only used for repairing ships, and for the reception of fishing boats and small craft. The river Arno connects Florence with the harbour of Leghorn. It is a well-built city, with many massive houses, which, if not elegant, are well calculated for a mercantile place. There is a ducal and an episcopal palace, many churches and hospitals, and more than 6000 houses, with 72,924 inhabitants. One third of the population consists of Jews, who are enclosed in a separate quarter, but otherwise enjoy greater privileges than in almost any other part of Italy. The trade is very extensive, and much ingenuity is applied to several branches of manufactures of a minute kind, such as works in coral, ivory, and marble, in distilling liqueurs, in preparing snuff, cream-of-tartar, soaps, starch, powder, leather, shot, and other articles. It is, next to Marseilles, the most extensive sea-port in the Mediterranean, and it is visited by ships from England, France, America, and the northern countries of Europe, and has considerable shipping belonging to its merchants, who trade chiefly with the towns in Northern Africa. The following table will show the several nations whose commerce with this port is carried on by their own vessels.

Statement of the Number of Vessels, distinguishing the Countries to which they belong, that entered the port of Leghorn in each of the Years 1829, 1830, *and* 1831.

Countries.	1829.	1830.	1831.
British	189	219	193
French	156	171	180
Russian	4	47	47
Swedish	34	29	29
Danish	12	10	10
Dutch	6	6	12
Austrian	30	152	106
Spanish	21	27	13
American	27	29	29
Neapolitan	194	235	266
Sardinian	898	698	686
Tuscan	1424	1336	1257
Lucchese	115	106	81
Roman	71	50	32
Greek	13	47	32
Hanoverian	3	...	...
Ottoman	...	2	...

The far greater proportion of Neapolitan, Sardinian, Tuscan, Lucchese, and Roman vessels, consists of small coasting craft, of from fifteen to twenty tons burden.

Account of the British Vessels that cleared out, with their Tonnage and Crews.

Years.	Ships.	Tonnage.	Crews.
1829	148	22,675	1381
1830	169	26,362	1627
1831	154	24,188	1468

The lighthouse is in longitude 10. 11. 25. E. latitude 45. 33. 5. N.

LEGION, in Roman antiquity, a body of foot, which consisted of different numbers at different periods of time. The word comes from the Latin *legere*, to choose; because, when the legions were raised, they made choice of such of the youth as were of the proper age to bear arms.

In the time of Romulus the legion consisted of 3000 foot and 300 horse, although, after the reception of the Sabines, it was augmented to 4000. In the war with Hannibal it was raised to 5000; after which it declined to 4000 or 4500, the number in the time of Polybius. The number of legions kept in pay together differed according to times and occasions. During the consular state, four legions were organized every year, and divided between the two consuls; yet we meet with as many as sixteen or eighteen, according as the situation of affairs required. Augustus maintained a standing army of twenty-three or twenty-five legions; but so large a number is seldom found in after times. The different legions borrowed their names from the order in which they were raised, thus *legio prima, secunda, tertia*: but as there might be many *primæ, secundæ, tertiæ*, they were surnamed from the emperors, as *Augusta, Claudiana, Galbiana, Flavia, Ulpia, Trajana, Antoniana*; or from the provinces which had been conquered by their means, as *Parthica, Scythica, Gallica, Arabica*; or from the deities under whose protection the commanders had particularly placed themselves, as *Minervia, Apollinaris*; or from the region where they were quartered, as *Cretensis, Cyrenaica, Britannica*; or from particular accidents, as *adjutrix, martia, fulmi-vatrix, rapax, victrix*. Each legion was divided into ten cohorts, each cohort into ten companies, and each company into two centuries. The chief commander of the legion was called *legatus* or lieutenant.

The standards borne by the legions were various. Originally the standard was a wolf, in honour of Romulus's nurse; afterwards a hog, which animal was usually sacrificed at the conclusion of a treaty, to indicate that war is undertaken with a view to peace; sometimes a minotaur, to remind the general of his duty of secresy, of which the labyrinth was an emblem. The figures of a horse and a boar were also borne; and Marius, we are told, was the first who exchanged all these for the eagle. See Army.

LEGISLATION.

The word Legislation is used in two senses; the one ancient, the other comparatively modern. In its ancient and most ordinary acceptation, it comprehends the science of law, as law ought to be; explaining the principles from which law should be universally derived, and also the rule to be observed in the application of those principles to particular countries. In its much more recent and restricted sense, it is made to represent as much of the contents of the municipal laws of a country, and as much only, as is created immediately by the supreme authority, acting in its legislative capacity. In either case, it is equally distinguished from the several meanings which have, at different times, been given by the majority of writers, to the word Jurisprudence. For instance, the science of legislation (or what law *ought to be*) is carefully separated by Mr Austin, in his *Province of Jurisprudence*, from the science of jurisprudence (or the qualities which are common to all laws,—what law therefore *is, and must be*), which it was the characteristic object of Mr Austin's lectures to interpret. Again, legislation, in both of the above senses,—whether used as meaning the science of perfect laws, or as descriptive of that portion of the body of any law which has emanated from the legislature itself,—is manifestly a very different subject from the jurisprudence (*prudentia juris*) of the Romans. In their written wisdom, jurisprudence was understood in its more primitive acceptation; in the meaning, in short, which with most persons and for most purposes it still retains, namely, that of a general and scientific knowledge of the laws, whatever they may be. There is a third and later meaning of jurisprudence, in which it is narrowed down to the usage of the courts. This application of it is of French invention, having been manufactured by them, in technical opposition to an equally peculiar construction which they had put upon the word legislation. This was done with the view of distinguishing between the positive letter of the codes (termed "legislation Française") and judicial decisions; which latter division of their laws they consequently thought fit specially to characterize by the name of jurisprudence. It is plain, therefore, that upon most occasions, legislation and jurisprudence will mean different things. But, on comparing legislation in the first and usual sense, as above mentioned, with the description of natural or universal jurisprudence, as copied in a succeeding paragraph from Adam Smith, it will appear that, until we come to the modifications introduced by particular legislation, these two sciences are substantially the same.

Man by the very constitution of his nature is social, and society supposes government. Investigations into the origin of government (as, for instance, whether, at its commencement, it was patriarchal or military) are amongst the creditable amusements of conjectural philosophy. But they are amusements only, when compared with practical criticisms on the form and the spirit of particular political institutions, or with the higher reasonings by which the true principles of a sound constitutional system are developed and determined. All political institutions are artificial constructions, admitting of great variety. But they may be brought under one or other of two comprehensive classes; since, in whatever hands the supreme authority of a state is lodged, it must be founded either on the partial interests of certain individuals, more or less numerous, or on the general interest of the whole community. According to which of these classes a government may happen to belong, there will be considerable difference in the aspect and object of its legislation; but from the moment one or two are gathered together into a society, their most pressing necessity is that of ascertaining or making the laws upon which the social interests of its members are henceforward to depend.

The universal elements of the science of legislation would seem to be sufficiently simple. Depending on the nature of things and of man, it may be thought there could be no mistake. Unfortunately, the history of the human race has not been so reasonable and so straightforward. It was late before the nature and condition of man, either as an individual or as a member of society, were analysed, with the view of determining the choice between opposite means of happiness, or of ascertaining the rules of justice. In process of time most of these questions were settled more or less rudely by the respective societies, without much consultation amongst each other. It was still later before the thought occurred of forming into a general system the common principles which all nations might be expected to adopt. Barbarism and sophistry had had such long possession, and had so confused and complicated the subject, that to discover these common principles is the great, and indeed arduous object of philosophical legislation.

Looking at legislation with the help of philosophy and history, it is evident that its uniformity has always been, and must always continue to be, disturbed by two causes, to a certain degree independent of each other. These are, the form of government, and the state of civilization. The contemporary tendency and character of laws will vary with the frame and nature of the political organization which has been employed in their manufacture. Much more will they vary with (as in truth the substance of them is necessarily derived from) the condition physical and moral, the intelligence and the public virtue, of each particular community.

The rules of municipal law are “in general intended,” says Adam Smith, “to coincide with those of natural justice. It does not indeed always happen that they do so in every instance. Sometimes what is called the constitution of the state, that is, the interest of the government, sometimes the interest of particular orders of men who tyrannize the government, warps the positive laws of the country from what natural justice would prescribe. In some countries the rudeness and barbarism of the people hinder the natural sentiments of justice from arriving at that accuracy and precision which, in more civilized nations, they naturally attain to. Their laws are, like their manners, gross, and rude, and undistinguishing. In other countries the unfortunate constitution of their courts of judicature hinders any regular system of jurisprudence from ever establishing itself among them, though the improved manners of the people may be such as would admit of the most accurate. In no country do the decisions of positive law coincide exactly, in every case, with the rules which the natural sense of justice would dictate.” The extent to which he conceived these aberrations to have proceeded appears in another passage. Speaking of the civil and criminal law of particular countries, he observes, “the principles upon which those rules either are or ought to be founded, are the subject of a particular science, of all sciences by far the most important, but hitherto perhaps the least cultivated,—that of natural jurisprudence.” Adam Smith calls the work of Grotius not only the first, but “as yet the most complete,” on this subject. The legislative writings of Mr Bentham (which have no necessary connection with his theory of morals) will form an equal era.

Robert Hall observed of Mr Bentham, that “in the particular province of his speculations, the science of legislation, he had advanced the limits of reason; and that if he were compelled to legislate for the world upon uninspired principles, he should take Bentham, and go from state to state with as firm a step as though he walked upon a pavement of adamant.” Had this eminent preacher given as much attention to law as to divinity, he would have seen that some further deduction should be made from this unlimited panegyric. There are striking warnings scattered over Mr Bentham's treatises upon legislation, of the respect due to both the disturbing causes above mentioned. But the general effect left, both by the matter and manner of his writings, upon most minds, is on one important point (that of domestic legislation) inconsistent with the forbearance and caution which he otherwise inculcates. For instance, an ardent disciple, impregnated with his principles, might be induced to alter the laws of his own country at once too suddenly and too far, and, when the alteration was made, to err equally in inferring that it was made for ever. Yet Mr Bentham was fully aware of the nature of the limitations and variations by which his general theory ought to be accommodated to practice. An express dissertation on the influence of time and place on subjects of legislation is set apart to the solution of the problem, how, the best laws being given, the legislator ought to modify them according to temporary and local considerations? There is nothing to add to his observations and admissions on the necessary effect of *change of place*, with reference to the propriety of transplanting laws from one people to another. He saw the difficulty of English law-making for India. But a great deal, we think, is wanting in his sketch of the probable effect of *change of time* in preventing the same laws from being equally suited to distant generations of the same people. He restricts this effect to the constitutional code, excluding almost entirely the civil and criminal codes from its operation. Montesquieu's Spirit of Laws, and the Treatise on Legislation by M. Comte, are excellent repertories of the principal facts by which travellers have established the variety that exists amongst the families of the human species scattered over the globe. The differences between the extreme limits of our common nature (to which differences all rational legislation will conform) are indeed immense. It was in this point of view that Burke received the lessons contained in Dr Robertson's History of America, and felt their application to all who have to take part in the government of man. The British statesman has acknowledged his obligations to the historian of the new world, in language which those of his countrymen who are bent on judging of all institutions by their own standard, and on assimilating all nations to themselves, would do well to recollect. “I have always thought that we possess at this time very great advantages towards the knowledge of human nature. We need no longer go to history to trace it in all stages and periods. History, from its comparative youth, is but a poor instructor. When the Egyptians called the Greeks children in antiquities, we may well call them children; and so we may call all those nations which were able to trace the progress of society only within their own limits. But now the great map of mankind is unrolled at once, and there is no state or gradation of barbarism, and no mode of refinement, which we have not at the same moment under our view: the very different civility of Europe and of China; the barbarism of Persia and of Abyssinia; the erratic manners of Tartary and of Arabia; the savage state of North America and of New Zealand.”

All this is very true, and yet a given race may be no more a fixed quantity (the proper subject of an identical legislation) than the human species itself. The historian of the old world has not, owing to the effect of lapse of time, his evidence as accessible as was the case with the historian of the new, in respect of a removal from one hemisphere to another. It should be observed, however, that it happened in the instance of the natives of America, that both the causes were at work. As to the extent of the changes wrought by time in the condition and character of the same nation, whilst dwelling on the same soil, nobody can doubt. And the legislators of successive periods must notice and follow out these changes, upon principles precisely similar to the precautions by which transplanted legislation is controlled. No greater suffering can be inflicted on a progressive people, than by the attempt at constructing immutable laws on the supposition of this partial immutability of nature. A system of uniformity and contraction which might fix for ages, as in a mould, some strangely stationary races (the Jews, the Medes and Persians, or the Chinese), must have been torture to the Greeks even of Sparta. If the Twelve Tables had been the perfection of appropriate legislation in the age of the Decemvirs, there can be no question but that Justinian's Institute was more in harmony with the contemporaries of Tribonian. It is probable that the Koran may not have been, even from the first, the best possible system for the followers of Mahommed. Supposing it to have been so, it is very certain that, through every change of circumstance, it could not remain the best for their descendants. Instead of stipulating, like the Locrians, that the man who at any time proposed a new law, should do so with a halter round his neck, when Locke undertook to legislate for Carolina, it was on the understanding that his laws were to be revised at the expiration of a hundred years. At the present moment, in all those moral and social qualities with which the law is concerned, the Hindu is not much more remote from the European than the actual generation of artificial Englishmen is separated from the Anglo-Saxon hordes, whom, nevertheless, they represent, in blood, in language, and in soil. Adam Smith is for putting a more extended meaning than Bentham and De Tracy will allow, on the celebrated saying of Solon, that he had given the Athenians, if not the best laws, the best that they could bear. We should say indeed that we know of no such thing as an abstract best in positive legislation. Best for them, is in their case best. To ascertain Mr Bentham's opinion, however, on this, as on other subjects, the whole body of his writings must be taken together. Otherwise, on looking at his personal ambition for becoming the legislator of almost every nation under heaven, and at his hypothesis, that no person was likely to legislate for a country so well as a stranger, it might be inferred, that he was disposed too hastily to pull down or to overleap the great partition-wall of national distinctions. In the same manner, the prospect on the effect of time, so narrow in the chapter alluded to, is elsewhere enlarged, until it embraces every distant contingency we could desire. Mr Bentham is aware that a periodical revision of its provisions will be a necessary supplement to a code. He was apparently unconscious of the property of accommodation which the admirers of the common law have discovered in its popular and malleable nature. So, in his first letter to Mr Madison, in 1811, after observing that the common law was nothing but "an ideal and shapeless mass of merely conjectural and essentially uncognoscible matter," he proceeds to complain of it as unfitted to our actual wants: "Law, which being, in so far as it could be said to be made, made at a multitude of successive periods, and for the use and governance of so many different generations of men,—men imbued with notions, habituated to modes of life, differing more or less widely from each other, as well as from those which have place at present,—would, even had it been well adapted to the circumstances and exigencies of the times in which its parts came respectively into existence, have, to a considerable degree, been thereby rendered, not the *better* adapted, but by so much the *worse* adapted, to the notions and manners *now* prevalent, to the state of things *at present* in existence." Admissions more extensive than these as to the vast alterations which the quiet hand of time, passing over the body of the laws and the character and condition of a people, must necessarily produce, severing them from each other wider and wider, even modern English law-makers, who are never easy but when tinkering at an act of parliament, could not possibly require.

The word law, in its proper and original sense, carries with it the notion of a superior. This intimation of supremacy is the principal quality conveyed in the widest definition of law, namely, "the expression of a will by a command." In this point of view the authoritative interposition of conscience enables moralists who adopt the theory of conscience to speak with perfect correctness of the law of morals. In their mouth it is no metaphor. What is the nature of the will, or of the command which may be coupled with the law, is an entirely distinct consideration. A frequent source of misconception (that of false analogies) would have been avoided, if writers had more carefully separated the several meanings in which the word *law* is used. Above all, there are two meanings, between which it is important to discriminate; one in which the difference consists in the subject of the laws, the other in their author. The first division is formed by the distinction between matter and the mixed human constitution,—between the passiveness and uniformity of matter, and the free agency and the consequent variableness of imperfect man. Hence originates the complete disseveration of those laws of the material world, which simply represent *what is*, from the laws of the moral world, which represent *what ought to be.* The laws of the material world are physical phenomena stated in a general proposition. The occurrence of a single exception would disprove the law. The laws of ethics, although really derived from and dependent upon human nature, presuppose a moral assumption with which the facts are to coincide. Accordingly, they will continue equally to be the laws of our moral being, even whilst they are violated every day. The second division is formed by the distinction between a perfect and imperfect legislator: between the legislative attributes of God and the legislative attributes of man. If Montesquieu had observed the first of these divisions, he probably would not have put in apposition so many different senses of the word law as are used in the following sentence, nor have left his readers to infer that the same word on these several occasions meant always the same thing: "The Deity has his laws: the material world its laws: intelligences superior to man their laws: the brutes their laws: man his laws." Attention to the second division would have protected Blackstone from quoting the description given by Cicero of the law of nature or morals as synonymous with that of positive or municipal law.[1] Speaking of municipal law, he has made the fact of law or no law depend upon its nature. According to the latter member of his definition, there can be no such thing as a bad municipal law; for he defines it to be "the rule of civil conduct prescribed by the supreme authority in the state, *commanding what is right, and prohibiting what is wrong.*" The consequence of so fallacious a proposition at the threshold, has been just what might have been expected. A mischievous confusion between particular and general jurisprudence pervades and perverts the whole of his elementary chapter. An assertion of this kind is unfortunately contradicted at once by the experience of great portions of mankind. A particular law, issuing from the supreme authority of the state, does not cease to be the law within the territories of that state, as long as the supreme authority is strong enough to enforce it, although it should command what is wrong, and prohibit what is right. Nevertheless, a lawgiver approaches to perfection only in proportion as he succeeds in his attempts to realize the other attributes of God; the attributes of goodness and of wisdom, as well as the coarser attribute of power. Goodness is wanted in order to supply general rectitude of intention; wisdom, in order to estimate the value of every specific end, and the aptitude of the means. A government with good intentions will propose for its object the happiness of the governed. But a government must be wise as well as good to enable it to discover the precise measures by which this object will be most effectually promoted.

One of the principal provisions of what is called constitutional law is, to organize such a system of electoral legislation as will return to the legislature a representative body, so identified in interest with the people as almost to guarantee rectitude in their intention. The wisdom of their measures will be in proportion to the statesmanlike knowledge of the individual members of whom the legislature is composed; their personal attainments being combined with and helped out by the knowledge of the persons whom they may happen to consult. It is improbable, for many reasons, that a legislature, and more especially a popular legislature, should at all times, or even at any time, possess a competent degree of knowledge wholly within itself. But there are no limits to the assistance from without which the supreme authority of a state has always at command. It need not be afraid of asking for advice. The doctrine of its supremacy can want no farther recognition than that it should keep the ultimate sanction and revision of the laws in its own hands. In this way it may accomplish much by means of foreign assistance. But if a legislative assembly is to have the full benefit of the ability of its own members, it must proceed, by a proper division of legislative labour, to distribute the work which it reserves for its own body, into appropriate departments. A prudent distribution of labour, although indispensable for preparing and digesting the materials, will not be enough. The deliberative assembly must, by well-considered regulations, secure the freedom and order of its own discussions. This done, no further condition regarding mere arrangements can be required, than that skilful draughtsmen should be called in for the mechanical operation of putting the meaning of the legislature into becoming form and language. The criminal laws of all countries, and even the civil laws of some, proceed upon the hard (although, in the first of these cases at least, the indispensable) presumption, *ignorantia legis neminem excusat.* It is clearly, therefore, an act of bare justice to the inhabitants of every country, first, that its laws should, as far as possible, be drawn up in such a manner as to be capable, with due attention on the part of sensible persons, of being correctly and completely understood; and next, after being made intelligible, that by due promulgation they should be made known.

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[1] Blackstone, 44, 122.

Amongst ourselves, the proceedings of the British parliament have forced the attention of thinking men, and must, sooner or later, force the attention of the public, upon these latter topics. One of our wants has been ably stated by Mr Wickens, in " an argument for more of the division of labour in civil life in this country." The height to which the grievance has grown can never be more strongly signified than in the extravagance of the suggestions which the late Sir John Sinclair made for its redress. The truth is, that the supreme legislature, or British parliament, occasionally troubles itself about many things which do not properly fall within the province of government at all. For the province of government has been properly defined to be " that of promoting the happiness of the community associated under it, by such measures as cannot be undertaken by individuals, or subordinate associations for themselves, or cannot be undertaken with equal advantage."[1] But, on our present system, we employ a steam-engine to crack nuts. We are frequently seen wasting the whole powers of the council of the nation over questions of a partial or local nature, with which (supposing them to be within the province of government) the supreme legislature at all events ought not to have interfered. These are the hundred minor matters which never came before the legislature until comparatively recent days; and which would have been in every way infinitely better disposed of, if they had been left to the discretion of subordinate jurisdictions, subject only to the supremacy of the state. With respect to such general measures as it is necessary to reserve, in the first instance, to the discretion of the supreme authority itself, it is equally clear that its work would be often done with incomparably greater ease and efficiency by a more prudent division and application of its force.

On this head, Mr Symonds, in a very judicious work entitled *The Mechanics of Law-making, intended for the use of Legislators, and all other persons concerned in the making and understanding of English Laws*, observes, that " in the progress of invention, schemers often discover new principles, that are fruitless, for the want of mechanical knowledge or skill to develope them in some tangible form. So our legislators often dream wisely, and talk after the fashion of their dreams; but, from ignorance and want of skill in the workmanship of details, which they leave to the routine performance of mere artisans, they seldom succeed in giving to the people a law intelligible either to themselves or the persons for whose especial guidance the law was designed. The beauty of a piece of mechanism is shown in the completeness of all its parts, and their combined action towards one grand general result. There is nothing excessive, nothing wanting. Each part has its special use, and is indispensable. Apply these principles to the English laws, what are they? The clumsiest pieces of workmanship which the unskilled labour of man ever made." " Our laws are written on different methods by different persons. Even those which should be, as the single act of the legislature, corresponding in spirit, structure, and terms, to other acts of the same body, are often antagonist to each other. The statutes of a single session contain every variety of anomaly that can be embraced in that species of composition. This must be the case till the legislature shall appoint persons to draw or revise all laws; to couch them in an uniform expression; or, at least, to take care that there be no difference in form where the substance is the same. If the time should ever arrive when our legislature shall, in its wisdom, determine on the adoption of such an expedient, it would be necessary that it should be preceded by a statute of directions, governing the arrangement, style, and character of our acts of parliament." Many enactments, which by their subject ought to be, and might be, perfectly accessible to the people at large, are made exclusive matters of professional knowledge, by the want of method, and by the exuberant phraseology in which the sense of almost all enactments is lost at present. Were the substance of parliamentary legislation as good as possible, its value would be infinitely lessened to us by the state in which it is issued to the world. The English statute-book is a vast jungle of technical tautology. The remonstrances of the late Lord Colchester, as far back as 1797, and the improved example of America, have hitherto been made in vain. Notwithstanding the criticism of Mr Miller in his right-minded book on the civil law, upon the precipitancy with which bills are hurried through the House; notwithstanding the suggestions and the specimens towards an amendment in the plan and language of our enactments, published ten years ago by Mr Uniacke and Mr Twiss; the statutory system of 1835 is shown to be just as bad as that of 1830. The impolicy and insufficiency of the principal arrangements of our legislation can of course be satisfactorily met only by corresponding changes. The following propositions are made by Mr Symonds, as comprising, in his opinion, the very minimum of what is necessary for any adequate reform. " There shall be some individual or individuals employed in the preparation of the information connected with every proposed new law, before it is formally proposed to the House; that the information so prepared should be submitted to a committee, who should report on the state of the matter, with a view to guide the House as to its further determination; that if the law should be determined upon, it should pass the usual stages of proceeding, being, however, before the second and third readings, reported upon by an officer charged with the verbal revision of its terms; that the law being passed, the heads of the department of the executive to which it relates, and other heads to be appointed specifically for the functions of public instruction, the administration of the law, religion, and justice, should superintend the promulgation and operation of such law; for which purpose, all questions arising upon it should be reported to such chief officer, by a regular body of reporters, attached to the courts of justice, and by the law officers of departments, where the matter should be determined upon by petition or memorial, without appeal to the courts of justice. There being a systematic report of all questions arising in the courts on each branch of the law, and fixed committees of the legislature to report upon such questions, the work of amendment would follow as of course. It would not be safe to omit any one of these parts of the machinery. They should all exist, acting in connection with each other, not for a season only, but throughout all time. The efficiency of the machine depends on its wholeness and permanence." From the absence of all counteracting provisions of this description, parliamentary legislation has fallen into such disorder, that the excellence of the regulations long ago adopted by the House of Commons, for securing the freedom and order of its deliberations, yield comparatively imperfect fruits. The wisdom of these regulations has been pointed out by Mr Bentham, with his usual comprehensiveness and minuteness, in his searching notice "upon the tactics of legislative assemblies." To use a humble illustration, there may be no fault to find either in the market or in the kitchen; the victuals may be good and the cookery excellent; yet the dinner may be spoiled by the dishing up, by the vessels into which it is put, and the manner in which it is served at table.

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[1] See on this point the *Rationale of Political Representation*, by the author of *Essays on the Formation of Opinions*.

A good *redaction* of laws is absolutely essential to their working well. Therefore, if the above censure of the English system of parliamentary legislation were only sufficiently near the truth to be even a plausible account of it, it would be pretty clear that there is no necessary connection between a representative government and a judicious method of framing laws. But the objection, as stated, principally applies to the mode in which this description of business is transacted in parliament, and to the form into which the results are thrown. Will the experience of English legislation, however, justify an observer in confining his criticisms within these bounds? Quite the contrary. It is equally clear, from the nature of the case and from experience, that a popular assembly, unless it adopt systematic arrangements for its guidance (somewhat similar to those suggested by Mr Symonds), must fall as far short in its competence to undertake the substance of some, at least, of its principal duties; for instance, the greatest of all,—the civil and criminal law,—with a view to their character and their improvement. With regard to its superintendence of the criminal law, the following was Blackstone's account of the matter as it stood in his day, and he was a writer not likely to exclaim without provocation. "The enacting of penalties, to which a whole nation should be subject, ought not to be left as a matter of indifference to the passions or interests of a few, who, upon temporary motives, may prefer or support such a bill, but be calmly and maturely considered by persons who know what provisions the laws have already made to remedy the mischief complained of, who can from experience foresee the probable consequences of those which are now proposed, and who will judge without passion or prejudice how adequate they are to the evil. It is never usual in the House of Peers even to read a private bill which may affect the property of an individual, without first referring it to some of the learned judges, and hearing their report thereon. And surely equal precaution is necessary when laws are to be established which may affect the property, the liberty, and perhaps even the lives of thousands. Had such a reference taken place, it is impossible that in the eighteenth century it could ever have been made a capital crime to break down (however maliciously) the mound of a fish-pond, whereby any fish shall escape, or to cut down a cherry-tree in an orchard. Were even a committee appointed but once in a hundred years to revise the criminal law, it could not have continued to this hour a felony, without benefit of clergy, to be seen for one month in the company of persons who call themselves or are called Egyptians." "It is a melancholy truth, that among the variety of actions which men are liable to commit, no less than an hundred and sixty have been declared by act of parliament to be felonies without benefit of clergy, or, in other words, to be worthy of instant death." Things have changed a little in this respect since Blackstone wrote. But in the way in which the change has taken place, nothing has transpired to affect the inference which Blackstone's language more than intimates to his reader. The inference can be nothing short of this: that a popular assembly is qualified neither morally nor intellectually for the responsible office of fixing the criminal law. Supposing it to be incompetent to the comparatively easy task of criminal legislation, the function of settling the principles and the detail of the civil law must, in the nature of things, lie still further beyond the sphere of its capacity. The civil laws of all countries have been, up to a certain point, more early established than the criminal; they strike their roots far deeper into the most intimate interests and relations of private life; they are complicated with the authority of precedents and the subtlety of refinements, such as do not enter at all into the plain and palpable objects of criminal provisions. They are accordingly everywhere vastly more voluminous. This is the spirit of the explanation given by the Chancellor d'Aguesseau, in his Mistakes on Law, on the disproportion which exists both in the digest and the code, between the space appropriated to private and to public law. Out of fifty books of the Digest, more than forty are given up to the former. If a popular assembly cannot move the lesser weight, it is not likely to intermeddle satisfactorily with the greater. The consequence is, that whatever reforms of any importance have taken or are taking place in England in either of these the principal departments of the law, they are altogether owing to the labours either of individuals or of commissions. A survey of the legal history of other countries corroborates the results of our experience at home. On comparing the state of the civil or criminal laws of two countries, the merit of their systems will not be found to vary directly as their freedom. On many occasions the interposition of a numerous assembly only retards and spoils. The operation is too scientific and delicate a one for popular hands. Bentham says expressly, that he undertook what is generally considered as the greatest of all his writings, that he might show that the tissue of laws, easy to be torn and difficult to be repaired, should not be delivered over to rash and ignorant workmen. In this point of view, arbitrary rulers have considerable facilities for prompt and extensive legislation; and, within the limits to which the above comparison is restricted, they have no temptation to abuse their advantages. Hardly any government can be conceived, in which the interest of the governors and of the governed does not for the most part coincide. When the most absolute governments go wrong concerning them, it is not for want of will to go right, but from the want of knowing better. If this be the case, and nevertheless a far greater amount of happiness be found, upon the whole, amongst free communities, of what vast importance to mankind are the inspiriting questions of constitutional law, and how inestimable are the health and animation breathed into a society by the very air of freedom. The public have to pay dearly for the pleasure which servile politicians may derive from the foolish couplet of the poet:

> For forms of government let fools contest:
> Whate'er is best administered is best.

The cause of truth, however, has much to lose and nothing to gain by any exaggeration. The zeal, therefore, of writers who attribute too much to the influence of government, is to be not less deprecated than the sophisms of others who attribute to it too little. Thus far is certain, that allowing the principal sources of human happiness to be naturally independent of all legislatures, and that, therefore, but little happiness can be directly originated by a government, its means for doing evil are immense. A good government, then, has this incalculable advantage; it protects the natural sources of human happiness from the invasion of others, and abstains from invading them itself. Half-truths are made whole falsehoods by precipitate generalizations. A comprehensive consideration of the proper objects, and of the effective capabilities of legislation, would have prevented the opposite errors; that of a depreciating despondency, as well as that of extravagant expectations. Living in England, Dr Johnson underrated the importance of the difference between institutions and laws of one kind or another. He saw that, compared with other sources of enjoyment, they were productive of but little immediate good; and he appears to have consequently inferred that they could also be productive but of little evil. On the other hand, Filangieri, living at Naples, was a daily witness of the infinite misery arising out of mis-government. He seems to have consequently supposed that legislatures had the power of creating prosperity and happiness in the same proportion. This account of the matter, although probably the true solution of the particular contradiction which we are noticing, stops short of the point at which the principal difference between the two classes of government will be most marked; their good faith in the execution of their laws. Laws cannot execute themselves. Therefore, whatever may be the comparative merit of two systems upon paper, it may be taken for granted that, if the one contains constitutional guarantees which are wanting in the other, there will be all the difference in the world in their practical results. It is certain that no government can long continue to be well administered, the good administration of which is not protected by guarantees. As far, therefore, as the very substance of the law is concerned, political arrangements for this purpose are indispensable conditions to the truth of Dr Paley's conclusion, "that *that* people, government, and constitution is the *freest* which makes the best provision for the enacting of expedient and salutary laws."

But the substance of the laws is not the only object of national legislation. A thing of still greater consequence is the spirit and character of the people. Civil liberty, however explained, is not sufficient of itself. There is great difference amongst jurists as to the proper meaning of the expression, *civil liberty*. If Mackintosh (on the correction of the phrase *jus gentium* for that of *jus inter gentes*) could reasonably doubt whether that particular innovation in a scientific term was one of those which repaid us, by its superior precision, for the uncertainty and confusion which the change occasioned, the same doubt must apply much more strongly in the present instance. It is not only important for the science of legislation, that a term supposed by many to imply its principal object,—but it is important, with a view to our vulgar and daily practice, that a term which is popularly used as the test of good government,—should be uniformly understood. Mr Austin has latterly defined civil liberty (and the language of Destutt de Tracy comes to the same thing) to be, "the liberty from legal obligation which is left or granted by a sovereign government to its own subjects." (*Province of Jurisprudence*, p. 279.) Thus, comparing two communities with each other, he would say that the degree in which they respectively enjoyed civil liberty depended upon their comparative freedom from legal restraint. According to this definition, it might happen that, in consequence of the absence of prudent restraints, the community which enjoyed the highest degree of civil liberty would on that very account be in possession of the worst government. On the other hand, the definition given by Paley (which agrees with that of Blackstone, and with the common understanding of the word), declares civil liberty to be "the not being restrained by any law but what conduces in a greater degree to the public welfare." Here civil liberty is distinguished from natural liberty, that is, from the mere absence of restraint, by being considered as that portion of natural liberty which, under the supposed circumstances, ought to be sanctioned by the law, and recognised by a just society, as constituting the social rights of all its members. Civil liberty is thus made synonymous with good government. On comparing two communities together, they may be subjected to very different degrees of restraint, and nevertheless may be in the equal enjoyment of civil liberty. All that, for this purpose, is required, is that, in the two cases, the different degrees of restraint which are respectively imposed shall conduce in the same proportion to the public welfare. It is very difficult (notwithstanding the explanation by Sir David Evans in his preface to the collection of the statutes) to extract a consistent sense out of Justinian's well-known definition. Blackstone, by mistranslating *jus* into *justice*, instead of *law*, and by leaving out the word *vi*, made it the authority for the definition, which he himself gave, and of which we have just been speaking. The words are, *naturalis facultas ejus quod cuique facere libet, nisi quid vi aut jure prohibetur.* That is, according to the translation of Blackstone, civil liberty consists in doing what you like, unless you are hindered justly or unjustly. So far all is certain. The paragraph in the Institute cannot have been meant to coincide with that into which Blackstone has tortured it. Were it not for the word *vi*, it might be supposed to mean the same with Mr Austin. But it appears to us, that its authors have attempted to compress more into this celebrated definition than it could possibly hold. Hence the dilemma. One of the conflicting words must be given up; and then the species of liberty which is defined will depend upon the word which is retained. If *vis* is retained, it will be a definition of natural liberty; if *jus*, of civil. Whatever construction is given to *naturalis* (and the whole definition is put in opposition to that of slavery imposed *jure gentium*), *naturalis facultas* must be used in two senses, and not in one, before *vis* and *jus* can be equally exceptions to it. Civil liberty, in all senses in which the term has ever been mentioned, is compatible with acts of *vis*, or illegal violence. Accordingly, Montesquieu's interpretation (for it is apparently intended as such) of Justinian discards this alternative, and admits only of the exception made by the law. "La liberté est le *droit* de faire tout ce que les loix permettent" (*droit* ought to be *pouvoir* or *moyens*, sc. *facultas*). Again, "La liberté est le gouvernement dont on jouit." In the Manchester debate, Lord Plunkett defended what had taken place, on the authority of a similar construction of the passage in Justinian. According to this notion of civil liberty, on comparing two communities together, the degree of it which they respectively enjoy will not depend upon the degree in which their respective freedom of action is left absolutely unrestrained, nor upon the proportion which may be observed between private restraint and public advantage, but will turn on the single question, which of the two governments is succeeding best in the complete and faithful administration of its actual laws. Thus liberty and law become the same thing, and this without any reference to the quality of the laws.

Of these conflicting definitions, it will be readily acknowledged that the intermediate one,—that by which civil liberty and good government are synonymous,—is the only one which can be properly considered as the principal end of legislation. Sir James Mackintosh, in his *Discourse on the Law of Nature and Nations*, expresses and justifies it with his usual truth of principle, and with more than his usual precision of language. The security of which man in society has need, is, it must be remembered, twofold; security against wrong from individuals, as well as from the government itself. "The description of liberty which seems most comprehensive, is that of *security against wrong*. Liberty is, therefore, the object of all government. Men are more free under every government, even the most imperfect, than they would be if it were possible for them to exist without any government at all: they are more secure from wrong, *more undisturbed in the exercise of their natural powers, and therefore more free, even in the most obvious and grossest sense of the word*, than if they were altogether unprotected against injury from one another." Now, as all unnecessary restraint imposed by government is a wrong, and as all individual restraint is unnecessary, unless an equivalent is obtained by it for the general advantage of society, all restraints which are unaccompanied by this advantage, are so many deductions from civil liberty. But, on the other hand, a restraint, by means of which we gain more in our personal freedom from the check put upon others (not to say sometimes upon ourselves), than we lose from being ourselves restrained to the same extent, leaves a balance of free agency in our favour, and becomes a part of civil liberty properly understood.

As long as political liberty is wanting, the written letter of civil liberty may indeed exist, but it will exist comparatively spiritless and fruitless. Experience has shown that the sense of security and of independence is no less essential to the advancement of society than to the comfort of individuals. Filangieri, having treated, in his Science of Legislation, of the causes of the decay of Spanish greatness, anticipates a similar declension of the power of England. B. Constant, commenting upon the passage in question, is far from professing any very decided opinion in favour of the general superiority of English legislation, But he attributes the decay of Spain to the truer reason; to the perpetual pressure of a government, which ground down the national intelligence, and which, in order to have nothing to fear from its subjects, kept them in apathy, and paralysed their powers. B. Constant proceeds with the other side of the picture. He was writing in 1822. "For the proof of this, we have only to look at England. We shall find there commercial laws not less absurd, not less vexatious, not less unjust. We shall see in the massacres of the Catholics, especially in Ireland, and in the execrable regulations which reduce all that portion of the Irish people to the condition of Helots, a pendant to the persecution and almost to the banishment of the Moors; and yet England has remained in the first rank among the nations. The reason is, that the political institutions, the parliamentary discussions, the liberty of the press, which England has uninterruptedly enjoyed for more than a hundred years, have counterbalanced the vices of her laws and of her government. Her inhabitants have maintained their energy of character, because they have not been disinherited of their participation in the administration of public affairs. This participation, although almost imaginary, gives her citizens a feeling of importance, which keeps their moral life in action; and England, governed, with few exceptions, since the time of Sir Robert Walpole, by Machiavellian ministers, and represented by a corrupt parliament, has nevertheless retained the language, the habits, and many of the advantages of freedom."

It is an important object in the organic structure of the legislative authority, that it should be compelled as much as possible to keep in the position, and be conversant with the views of legislation only; that, having legislated, it should be, as it were, *functus officio*, and that the interpretation and execution of its laws should thenceforth be transferred to other departments of the state. In this consists one of the main advantages of a mixed or constitutional government. It not only affords the opportunity,—it almost creates a necessity,—for separating the exercise of the legislative, judicial, and executive authorities from one another. Notwithstanding the classical immortality conceded to Minos, Lycurgus, and Solon,—Mr Bentham, who could have no prejudice in favour of chambers over individuals as legislators, says, that he cannot discover in antiquity the traces of any true knowledge concerning legislation. It seems impossible that the Greeks should have had any knowledge on the subject, whether as to the organization of a legislature, or the principles of law, which should not have been communicated to the Romans. But what in this respect was the history of Rome throughout all the period concerning which the history of Rome is usually thought to be worth reading? With the genius, which the military and administrative masters of the world ultimately exhibited as its law-makers, it seems quite extraordinary that the personal application of their legislative intelligence to their own affairs should have been so long in growing. Cicero, boasting of the perfection of the Twelve Tables, and of the short time which it took to learn the Roman law, never seems to have been aware that this account of it was a symptom of its deficiencies, just as would be the case with a boasting Turkish cadi at the present day. The few lines in which the philosophical Tacitus dismisses the mass of laws which by his time had accumulated upon the practitioner and the public to an unmanageable bulk, are as severe a satire as a more laboured commentary. Professing to turn aside to the principles of Roman jurisprudence, and to the methods by which Rome had reached its infinite multitude and variety of laws, he conveys to the reader his deliberate opinion, that the Twelve Tables were the *finis æqui juris*, and that they comprehended whatever was really just and valuable in Roman law. "The laws which followed, although sometimes directed against wrong-doers, were generally passed by violence, either through the dissension of the orders, or for the sake of gaining unlawful honours, or in order to expel distinguished men, or for some other disgraceful object." This was no peculiar fancy taken up by Tacitus for the sake of throwing one of his Caravaggio-shadows over the picture. The popular Livy, too, who loved to see and to paint every thing brightly, finds equally in these ancient records the fountain of public and private law. Up to the time of Cicero, what could be the actual laws of Rome or the Roman world, when he appealed (*fremant licet*) to these Twelve Tables as the pillars of Hercules, which civil philosophy could never hope to pass? So much for the legislation of the Roman Republic, and for lamentations over what the world has lost in lessons of legal wisdom (at least up to the age of Tacitus) by the negligence or the treachery of Tribonian. What is called the age of its classical jurisprudence visited the Roman law at last. By the time of Papinian and Ulpian, the various other sources from which the laws of every country must always be more or less derived, had sent forth such abundant streams, that Tribonian and his colleagues had nothing to do but choose amongst them from what waters they should fill that imperishable reservoir at which all future generations were to come and drink. Had the Roman constitution made a juster arrangement of the three great political powers, it is improbable that so much of its laws should have had to be sought for in these indirect channels. And, in that case, it would have been impossible that the period of their being brought together and united in one majestic body should have been deferred so long. But there is another consideration, of still greater consequence to contemporary generations than even the formation of a system of jurisprudence. In that case, it would have been equally impossible, that a hundredth part of the injustice, whether legislative, judicial, or executive, with which Roman history swarms, should ever have been committed. The Romans as a nation seem to have remained for ages incapable of discerning the fundamental difference between a legislative and a judicial act. It is a distinction upon which the English constitution is founded, and is carefully described by a great master in politics. "A legislative act has no reference to any rule but these two, original justice, and discretionary application. Therefore it can give rights—rights where no rights existed before; and it can take away rights where they were before established. For the law, which binds all others, does not, and cannot, bind the law-maker; he, and he alone, is above the law. But a judge, a person exercising a judicial capacity, is neither to apply to original justice, nor to a discretionary application of it. He goes to justice and discretion only at second hand, and through the medium of some superiors. He is to work neither upon his opinion of the one nor of the other; but upon a fixed rule, of which he has not the making, but singly and solely the *application* to the case." (Burke, vol. x. p. 66.) He adds, addressing the House of Commons on the case of Mr Wilkes, in the Middlesex election: "In our legislative capacity we are in most instances esteemed a very wise body. In our judicial we have no credit, no character, at all." M. Comte, we perceive, admits the pre-eminence of England upon questions of legislation. The authority, it is true, of the English parliament as representing the public weal, has acted throughout all English history like a charm. Should it be doubted whether the legislative reputation of parliament stands at present quite so high with the English public as Burke imagines it to have stood in 1771, there can be no doubt but that its judicial reputation continues quite as low. But in this, as in other cases, a disorder is half cured when its cause is known. It was the misfortune of the Roman government, owing to the confusion in which the exercise of all authorities was mixed up together under it, that there were not always the means, in point of fact, and there was never any sound and recognised principle of law to appeal to, as a test distinguishing between them.

The study of the science of legislation is the noblest of all studies. The art of applying this science to the practical necessities of mankind is the noblest of all professions. Nothing can more tend to fill the understanding and elevate the spirit of a human being. Every legislator, to be worthy of his office, ought to have a high idea of its dignity. He should think it is his duty to learn the boundaries of the science, and to master the criteria which determine what is contained in and what excluded from it. Its legitimate province is so immense that no single intelligence can be capable of cultivating and commanding the whole of it. Different individuals will be guided by appropriate considerations, private and public, respecting the special departments they particularly select. But whether the department be easy or laborious, one or many, the spirit and the principles by which its legislation ought to be conducted will be the same. The previous knowledge of the general nature of his subject, which is for this purpose required of a statesman, is not to be picked up in a day. Members of society, one and all, stand, with regard to the body of which they are parts, in two opposite relations; and they are entitled to demand that their joint and several interests in both relations should be measured and respected. It is their right, on the one hand, that no restraint shall be imposed upon any individual, but what will contribute in a greater degree to the public welfare. It is not less their undoubted right, on the other hand, that whenever a restraint will so contribute, it shall be forthwith imposed upon all. If unnecessary restraints are so much wanton destruction of human happiness, the omission or relaxation of necessary restraints may be no less fatal. They expose to wanton injury the means of happiness, which the law ought to protect, and they compel the party injured to seek out the imperfect remedies of irregular and barbarous times, and to carve out for himself the reparation which the law refuses. To draw lines of this description justly, is the work of great observation and profound philosophy combined. What investigations does it not require on the nature of property. We need only allude to the controversy between Grotius and Selden, on the famous question of the freedom of the seas; and to the absence of all principle in the unsatisfactory regulations respecting animals, called *feræ naturæ*, in the laws as well of France as of England and America. What discrimination does it not require in marking the subtile limits by which, in the case of a hundred rights and duties, morals are separated from law. Principles and examples of this kind are to be found in abundance in the great writers upon duty and natural jurisprudence.[1] In the legislation of every country—certainly in that of England—there are many instances of some actions being made cognizable by law which more properly belong to morals; and of others being left to morals, which ought to be brought under the penalty of the law. A due examination into the boundaries of morals and law can scarcely fail to inspire becoming caution wherever there is a chance of opposite laws being brought into collision with each other. Occasions may easily be conceived when a man will be called upon to perform an action which shall place him within the concentric circles of the several jurisdictions of the divine law, the law of morals, the law of honour, the law of nations, and the law of the land. If these several laws, acting with their respective sanctions, concur in the line of duty which they require of him, all is well. Wo to him if they should pull in opposite directions. A government is answerable for the lives and consciences of men, whenever, without an absolute necessity, it drives its subjects to this terrible alternative.

The following passage is taken from Burke's tract on the Irish popery laws. No argument that human wisdom can devise would prove more forcibly the wickedness of legislating against the law of morals,—that is, against the paramount principles of human nature,—than that a political reasoner like Burke should have been so maddened by the contradiction, as to find there the legal evidence by which municipal laws are annulled, instead of the moral authority by which they are resisted. "The true weakness and opprobrium of our best general constitutions is, that they cannot provide beneficially for every particular case, and thus fill, adequately to their intentions, the circle of universal justice. But where the principle is faulty, the erroneous part of the law is the beneficial, and justice only finds refuge in those holes and corners which had escaped the sagacity and inquisition of the legislator. The happiness or misery of multitudes can never be a thing indifferent. A law against the majority of the people is in substance a law against the people itself: its extent determines its invalidity; it even changes its character as it enlarges its operation; it is not particular injustice, but general oppression; and can no longer be considered as a private hardship, which might be borne, but spreads and grows up into the unfortunate importance of a national calamity. Now, as a law directed against the mass of the nation has not the nature of a reasonable institution, so neither has it the authority; for in all forms of government the people is the true legislator; and whether the immediate and instrumental cause of the law be a single person or many, the remote and efficient cause is the consent of the people, either actual or implied; and such consent is absolutely necessary to its validity. To the solid establishment of every law two things are essentially requisite; first, a proper and sufficient human power to declare and modify the matter of the law; and, next, such a fit and equitable constitution as they have a right to declare and render binding. With regard to the first requisite, the human authority, it is their judgment they give up, not their right. The people, indeed, are presumed to consent to whatever the legislature ordains for their benefit; and they are to acquiesce in it, though they do not clearly see into the propriety of the means by which they are conducted to that desirable end. This they owe as an act of homage and just deference to a reason which the necessity of government has made superior to their own. But though the means, and indeed the nature, of a public advantage, may not always be evident to the understanding of the subject, no one is so gross and stupid as not to distinguish between a benefit and an injury. No one can imagine, then, that an exclusion of a great body of men, not from favours, privileges, and trusts, but from the common advantages of society, can ever be a thing intended for their good, or can ever be ratified by any implied consent of theirs. If, therefore, at least an implied human consent is necessary to the existence of a law, such a constitution cannot in propriety be a law at all. But if we could suppose that such a ratification was made, not virtually, but actually, by the people, not representatively, but even collectively, *still it would be null and void.* They have no right to make a law prejudicial to the whole community, even though the delinquents, in making such an act, should be themselves the chief sufferers by it; because it *would be made against the principle of a superior law*, which it is not in the power of any community, or of the whole race of man, to alter,—I mean the will of Him who gave us our nature, and, in giving, impressed an invariable law upon it. It would be hard to point out any error more truly subversive of all the order and beauty, of all the peace and happiness, of human society, than the position that any body of men have a right to make what laws they please; or that *laws can derive any authority from their institution merely, and independent of the quality of the subject-matter.* No arguments of policy, reason of state, or preservation of the constitution, can be pleaded in favour of such a practice. They may indeed impeach the frame of that constitution, but can never touch this immoveable principle. This seems to be indeed the doctrine which Hobbes broached in the last century, and which was then so frequently and so ably refuted. Cicero exclaims with the utmost indignation and contempt against such a notion (*de Legibus*, lib. i. 15, 16); he considers it not only as unworthy of a philosopher, but of an illiterate peasant; that of all things this was the most truly absurd to fancy, that the rule of justice was to be taken from the constitutions of commonwealths, or that laws derived their authority from the statutes of the people, the edicts of princes, or the decrees of judges. If it be admitted that it is not the black letter and the king's arms that make the law, we are to look for it elsewhere. In reality, there are two, and only two, foundations of law; and they are *both of them conditions, without which nothing can give it any force;* I mean *equity* and *utility.* With respect to the former, it grows out of the great rule of equality, which is grounded upon our common nature, and which Philo, with equal propriety and beauty, calls the mother of justice. All human laws are, properly speaking, only declaratory; they may alter the mode and application, but have no power whatever over the substance, of original justice. The other foundation of law, which is utility, must be understood, not of partial or limited, but of general and public utility, connected in the same matter with, and derived directly from, our rational nature; for any other utility may be the utility of a robber, but cannot be that of a citizen; the interest of the domestic enemy, and not that of a member of the commonwealth. This present equality can never be the foundation of statutes, which create an artificial difference between men, as the laws before us do, in order to induce a consequential inequality in the distribution of justice. Law is a mode of human action respecting society, and must be governed by the same rules of equity which govern every private action; and so Tully considers it, in his Offices, as the only utility agreeable to that nature. *Unum debet esse omnibus prepositum, ut eadem sit utilitas uniuscujusque, et universorum; quam si ad se quisque rapiat dissolvetur omnis humana consortio.*" It is no wonder that this kind of conflict between opposite laws of distinct authority which outraged Burke, should have also misled Blackstone. Locke, *On the Extent of the Legislative Power*, equally denies the moral right to legalize injustice; and Hooker the same; but Locke afterwards (vol. ii. p. 250), in his letter on toleration, shows that he is aware that the rectification of a similar abuse of power is to be sought for in the field of battle, not in a court of justice. "What if the magistrate believe that he has a right to make such laws, and that they are for the public good, and his subjects believe the contrary? Who shall be judge between them? I answer, God alone. There are two sorts of contests among men, the one managed by law, the other by force; and these are of that nature, that, where the one ends, the other always begins."

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[1] Bishop Sanderson's *Sermons*, 274; Jeremy Taylor, vol. i. 241; *On Obligation and Relaxation of Human Laws*, vol. xiii. 230; *Traité de Legislation*, vol. i. 93.

But there is as little excuse for some of the contradictions which subsist between the positive laws of different nations. Most of them might be removed by a judicious comparative legislation. In this point of view, it is highly desirable that the independent states, which constitute the great commonwealth of the civilized world, should make a rational *concordance* of those chapters of their municipal laws, in which the subjects of all must, from their intercourse with each other, have a common interest. Mr Justice Story has done much towards opening the way both to the end and to the means, in his *Commentaries on the Conflict of Laws in regard to Contracts, Rights, and Remedies, and especially in regard to Marriages, Divorces, Wills, Successions, and Judgments.* The state of things by which a couple are married or unmarried, according as they may happen to be in France, Scotland, or England, is hardly less monstrous than the contradictory title which, on the doctrine of a double allegiance, England and America, for instance, may set up to the obedience of the very same individual,—each being ready to enforce its legal title by the extreme sanction of the law. England is likely to have the honour of leading the way on one subject. Mr Justice Story elsewhere observes on the predominance which the system of commercial law, as established in England, is obtaining over the world; and anticipates that Europe has nearly arrived at the point when the same commercial principles will form part of the public law of all its sovereignties. If, in the last generation, Lord Mansfield acquired this honour for his country and for himself, whilst dealing with and conciliating the gracious interests growing up from out of the civilizing intercourse of peace, Lord Stowell has in our own time derived an equal glory from out of the calamities and injuries of war. Foreigners, looking on upon the just and liberal jurisprudence administered in his prize-courts, have thought it not too much to call him the ornament, not of his "own age or country only, but of all ages and all countries; the intrepid supporter equally of neutral and belligerent rights; the pure and spotless magistrate of nations."

The mischief arising from intemperate and ignorant enactments makes it of great importance to fix accurately, in every case, the true limits of prudent legislation. Thus, the sphere of mischief is railed in; and thus also a legislator may more easily learn the extent of the knowledge which he has to acquire, and of the responsibility which he incurs. From the mode in which Burke's political maxims are scattered about in the different parts of his voluminous writings, as the occasion happened to call them forth, the greater and more philosophical portion of them are not so stedfastly recollected by the public as must have been the case if they had been incorporated and presented in a more systematic form. Having occasion to restate the principles expressed by Burke, it would, however, be great injustice to the reader to express them in other words. "It is," says he, "one of the finest problems in legislation, and what has often engaged my thoughts whilst I followed that profession, 'what the state ought to take upon itself to direct by the public wisdom, and what it ought to leave, with as little interference as possible, to individual discretion.' Nothing, certainly, can be laid down on the subject that will not admit of exceptions, many permanent, some occasional. But the clearest line of distinction which I could draw, whilst I had my chalk to draw any line, was this,—that the state ought to confine itself to what regards the state, or the creatures of the state, namely, the exterior establishment of its religion; its magistracy; its revenue; its military force by sea and land; the corporations that owe their existence to its fiat; in a word, to every thing that is *truly and properly* public; to the public peace, to the public safety, to the public order, to the public prosperity. In its preventive police it ought to be sparing of its effects, and to employ means, rather few, unfrequent, and strong, than many and frequent, and of course (as they multiply their puny politic race, and dwindle) small and feeble. Statesmen who know themselves will, with the dignity which belongs to wisdom, proceed only in this, the superior orb and first mover of their duty, steadily, vigilantly, severely, courageously; whatever remains will, in a manner, provide for itself. But as they descend from a state to a province, from a province to a parish, and from a parish to a private house, they go on, accelerated in their fall. *They cannot do the lower duty; and in proportion as they try it, they will certainly fail in the higher.* They ought to know the different departments of things; what belongs to laws, and what manners alone can regulate. To these, great politicians may give a leaning, but they cannot give a law. Our legislature has fallen into this fault, as well as other governments; all have fallen into it more or less."

A great deal is here excluded. Much of what the Puritans legislated for instantly on their arrival in New England; much of that on which the imperial parliament of Great Britain is often unwisely called upon to legislate at present; for example, amongst other things, for the better observation of the Sabbath. Quite enough, however, is left for the most industrious and intrepid statesman. The discussion of the questions which Burke reckons truly legislative, instead of being disposed of in the few paragraphs of a summary, would occupy each a volume by itself. Besides, whatever may be the precise subject on which a legislator may be engaged, he should always remember that there is that sympathy and connection between the several parts, even of the most irregular system, that he can never be safe in dealing with any specialty or fragment of it unless he knows something also of the rest, or knows at least the general bearings of the divisions which adjoin.

In a view of legislation, however cursory, it would be unpardonable to omit the outline sketched by the masterly hand of one who was certainly the greatest and the wisest (and we believe very far from the meanest) of mankind. What a treasure for all ages, had but the outline been filled up by his weighty sentences, and with his capacious views. "For the more public part of government, which is laws, I think good to note only one deficience: which is, that all those which have written of laws, have written either as philosophers or as lawyers, and none as statesmen. As for the philosophers, they make imaginary laws for imaginary commonwealths, and their discourses are as the stars which give little light, because they are so high. For the lawyers, they write according to the states where they live, what is received law, and not what ought to be law; for the wisdom of a law-maker is one, and of a lawyer is another. For there are in nature certain fountains of justice, whence all civil laws are derived but as streams; and like as waters do take tinctures and tastes from the soils through which they run, so do civil laws vary according to the regions and governments where they are planted, though they proceed from the same fountains. Again, the wisdom of a law-maker consisteth not only in a platform of justice, but in the application thereof, taking into consideration by what means laws may be made certain, and what are the causes and remedies of the doubtfulness and uncertainty of law; by what means laws may be made apt and easy to be executed, and what are the impediments and remedies in the execution of laws; what influence laws touching private right of *meum* and *tuum* have into the public state, and how they are to be made apt and agreeable; how laws are to be penned and delivered, whether in texts or in acts, brief or large, with preambles or without; how they are to be pruned and reformed from time to time, and what is the best means to keep them from being too vast in volumes, or too full of multiplicity and crossness; how they are to be expounded, when upon causes emergent, and judicially discussed; and when upon responses and conferences touching general points or questions, how they are to be pressed, rigorously or tenderly; how they are to be mitigated by equity and good conscience; and whether discretion and strict law is to be mingled in the same courts, or kept apart in several courts. Again, how the practice, profession, and erudition of law is to be censured and governed, and many other points touching the administration and (as I may term it) animation of laws."[1]

We have no very great respect for what are called fundamental laws. We do not share in the want of confidence which they imply in the wisdom and virtue of posterity; which wisdom and virtue, when once wanting, a mere paper constitution can do nothing to supply. They are, we are convinced, far more likely in most cases to retard the progress of a country for the future, than to secure in perpetuity, or for a day, the possession of those advantages which have already been obtained. At the same time there are a few leading principles in politics pretty well settled. And if bills of rights, charters, and constitutions, confined themselves to these, as much good perhaps as harm might accompany the declaration of them. But the particularity to which the constitutions of some of the American states have descended is ridiculous now, and may be mischievous hereafter. For this it is sufficient to refer to the commentaries of Chancellor Kent. Few countries have sought to tie up the body of their civil and criminal laws in leading-strings of this description. Laws of this class (except in rare instances of occasional presumption) are respected as great problems, on which mankind may as yet have much to learn, and which therefore had best be left open for whatever improvements time and discussion may suggest. With regard to them, therefore, we will premise a few very general directions. They may well claim to be approached in the spirit both of a philosopher and an historian.

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[1] *The Advancement of Learning.*

1. On approaching the subject, a reflecting person must perceive the necessity of laying out before him, in the first instance, as it were upon a map, the leading principles of general jurisprudence. What these are can only be learned from a patient analysis of human nature. Here Romagnosi and Comte call on him to observe the powerful tendencies of mankind, of which the law ought to be the express image. Here Bentham points out the anti-social passions which it is one of the first offices of the law to thwart and to subdue. Here come in Destutt de Tracy's admissions, the more important in proportion as they appear reluctant and extorted, on the necessity of watching and picking out our way amongst the contradictions and infirmities of our imperfect nature. If it be true that the laws of nature exist anterior and superior to ours,—that what is fundamentally just is that which is in conformity with them, what is radically unjust is that which is opposed to them; and therefore that our laws, inasmuch as they are weaker and subsequent, should, in order to be good, be in harmony with these natural laws of greater antiquity and strength,—it is no less true, that the immediate feelings and opinions of considerable bodies of men often represent so ill the interests of the actual generation (those of the next often not at all), that the real interests, even of the parties themselves, much more those of mankind, including the generations that come after, will be best promoted by their immediate feelings and opinions receiving a peremptory contradiction from the law. All that is wanted in any case, in justification of thus much of contradiction, is to suppose that the restraints are wisely placed, and that the members of the community in question, at least that part of them which is not incorrigible, are capable, like those of a well-regulated family, of accommodating their wills to the restraints. Destutt de Tracy agrees with Montesquieu, when Montesquieu is treating of the disadvantages of certain climates, in considering "that bad legislators are those who favour the vices of the climate; good, those who are opposed to them." The maxim is equally true of all evil tendencies, however generated. And the problem to be solved is in every case the same; the cost of the opposition, and the probability of success. On the one hand, you must not expect too much, and enter upon a vain contest. On the other, you must not put up with miseries and scandals that a little vigour would remove. Connected with this part of the subject, or rather practical parts of it of the greatest nicety, are the two important questions; first, at what point in any given instance the predominance of personal or local peculiarities is so great as to overbalance the considerations upon which the general principle had been constructed; and, next, what are the cases where observation and reason can only show that it is necessary there should be *some* rule, but are not able clearly to discover *what* the rule should be. If man could be kept right in his body natural or politic by a few universal principles, the sciences of medicine and of legislation would be comparatively easy. But there is no limit to the modifications which the use of the most approved specifics may require; and the best statesmen are quite as well aware as the best physicians, that a knowledge of the constitutions of their patients is no less necessary than a knowledge of the theory of their respective arts. Before simplicity and uniformity can be merits, there must be simplicity and uniformity in the subject to which they relate. Now these are not among the characteristics of man. Accordingly, Bacon has directed the attention of lawgivers towards the particular exceptions to general jurisprudence which differences in regions and governments must always be introducing into the different systems of practical law. The conquerors of the East, whether ancient Greeks or modern Britons, have felt the obligation of respecting usages so originating. Mr Bentham feels this so strongly that, in indulgence to immemorial custom, he questions, for instance, our laws against infanticide in Cutch. Nothing is more to the credit of the discretion of our Indian government than the gradual measures by which they proceeded against suttees; measures, where every symptom and circumstance required to be watched as the experiment was going on, in order to ensure its success. A great portion of the rules of property are expedients in solution of the other dilemma. On the one hand, property exists everywhere; property, by law established. To ask, therefore, whether there should be such a thing as private property, is, in other words, to ask whether there should be such a thing as society. And if utility requires property as an institution, it equally requires that the conditions of it should be fixed by the only authority capable of fixing it,—the municipal law of the country where the question arises. On the other hand, an enumeration of the countless diversity of these conditions in different countries would cover pages. Some of them certainly might be drawn nearer to each other by the line of reason. But many are purely arbitrary, and must always remain so. Hume, towards the conclusion of his appendix on *Farther Considerations with regard to Justice*, explains (in a passage which Paley has enlarged) the slight analogies to which, in cases of this description, legislation must resort. "When natural reason points out no fixed view of public utility by which a controversy of property can be decided, positive laws are often framed to supply its place, and direct the procedure of all courts of judicature. Where these two fail, as often happens, precedents are called for; and a former decision, though given itself without any sufficient reason, justly becomes a sufficient reason for a new decision. If direct laws and precedents be wanting, imperfect and indirect ones are brought in aid; and the controverted case is ranged under them, by analogical reasonings and comparisons, and similitudes and correspondences, which are often more fanciful than real. In general it may safely be affirmed, that jurisprudence is, in this respect, different from all the sciences; and that in many of its nicer questions, there cannot properly be said to be truth or falsehood on either side. If one pleader brings the case under any former law or precedent, by a refined analogy or comparison, the opposite pleader is not at a loss to find an opposite analogy or comparison. And the *preference given by the judge is often founded more on taste and imagination than on any solid argument.* Public utility is the general object of all courts of judicature; and this utility, too, requires a stable rule in all controversies. But where several rules, nearly equal and indifferent, present themselves, it is a very slight turn of thought which fixes the decision in favour of either party." If the well-known distinction between legislation and that part of the administration of justice the results of which we are learning to call jurisprudence had been present to the mind of the philosopher whilst he was writing the above paragraph, he would have perceived that he was de-

scribing the course of the first, and not the second. Courts of justice may be driven to such resources by a necessity more or less imperative. Whenever they are so, the difference in this respect between their course in adjudicating upon questions which arise under the common law and those which arise upon the statute law is, at the most, only a difference in degree; and, in the two cases, their comparative authority was originally construed quite the reverse from what is usually understood at present. Nevertheless, in truth, the court must be always discharging, on these occasions, the office of a legislator, not a judge. In another part of his works, Hume notices the very delicate question, What are the degrees of relationship within which marriage ought not to be contracted? This is another of those cases in which philosophical jurisprudence can do no more than intimate the principle. "Love between the nearer relations is contrary to reason and public utility; but the precise point where we are to stop can scarcely be determined by natural reason, and is therefore a very proper subject for municipal law or custom. If the Athenians went a little too far on the one side, the canon law has surely pushed matters a great way into the other extreme." On taking leave of the preliminary inquiry into general jurisprudence, it is no exaggeration to say that Mr Bentham was the first jurisconsult who ever applied, with any thing like adequate detail, a searching analysis of human nature to the elements of law. His catalogues of the pains and pleasures of which man is susceptible, have acted like a blister to the former plausible and superficial systems. With an analysis of this sort on their tables, an end has been put to those more ancient and contradictory catalogues of the laws of nature which bookish scholars so long invented at their pleasure. Had it existed earlier, we should not have had, for instance, Domat and Montesquieu at issue on the very principle of filial inheritance; Domat declaring that it is a law of nature that children should succeed to the property of their parents; Montesquieu, on the other hand, declaring that it is a law of nature that a parent should exercise his discretion.

2. After having settled his map of general jurisprudence on the common principles of human nature, a wise legislator will proceed to examine the legislation of the particular country for which he is about to legislate. This must lead him on every subject to a complete and correct view of the progress and actual condition of its law. Mr Bentham, in his *Theory of Legislation*, has treated history too much like an old Almanac. It is indeed the standard defect of his writings, that he seldom looks for help from any other understanding except his own. The sages of the English law, however, have every reason to be content with the value which he teaches the legal reformers of England to put upon their collected labours. "Traverse," he observes, "the whole Continent of Europe; ransack all the libraries belonging to the jurisprudential system of the various political states; add the contents of all together, and you would not be able to compose a collection of cases equal in variety, in amplitude, in clearness of statement, in a word, in all points taken together, in instructiveness, to that which may be seen to be afforded by the collection of *English Reports of adjudged Cases*, on adding to them the *Abridgments and Treatises*, by which a sort of order, such as it is, has been given to their contents." (*Papers Relative to Codification*, 1817.)

3. The legislator ought in the next place to compare, on all points of importance, different systems of jurisprudence with each other. The necessity of this extended information on the part of the English legislature arises from even a higher duty than that of enlarging the sphere of philosophical induction. It is a direct necessity imposed on its members, by the fact that there is scarcely a species of law existing on the face of the earth which is not within the province of their immediate superintendence. "At this moment there are few of the systems of legislation, either of ancient or modern times, which are not in force as living law within the British empire. Menu and Mahommed decide the civil rights of the Hindu and the Mogul; and an appeal from India compels our privy councillors to consult the Koran and the Puranas as authorities at Whitehall. Justinian is obeyed by the courts of the Ionian republic. In the Norman isles, the severed portions of the domains of the conqueror, the barbaric custumal framed by his justiciars still guides the grand bailiff and the seneschal, who dispense the equity of Rollo, now forgotten in the hall of Rouen. Canada cherishes the volumes which have been cast forth from the palace of justice; and the legitimate representatives of the proud and learned presidents of the parliament of Paris, are found in the court-house of a colonial town. Banished from the flowery meadows of the Seine, the ordinances expounded by Saint Louis beneath the oak-tree at Vincennes constitute the tenures of lands on the Gulf of St Lawrence; and, whilst every vestige of feudality has been blotted out of the title-deeds of the European continent, it remains in full vigour in the wilds and wastes of the New World. In the opposite hemisphere, we bestow an equal protection on the codes of Napoleon; and it is possible that, in future ages, the speck of land, the Mauritius, in which they are now in force, may alone preserve the vestiges of the jurisprudence of the Great Empire. Our sovereign appoints his alcades and his corregidors in the Indies of Columbus; whilst his landrosts in Southern Africa are guided by the placets of the states-general of the departed republic of the Netherlands. The laws of king Christian of Denmark are administered by British authority in the torrid zone. And the deemsters assembled on the Tynwald of Man have not abandoned the polity of the sea-kings of Scandinavia. It is difficult to question the policy which first induced England to soothe her stranger subjects, by thus indulging them with the exercise of the laws which habit had rendered dear to them. But our legislators should now begin, slowly and cautiously, to assimilate the institutions of the dependencies to those of the mother country."[1]

4. *Lastly*, a legislator should be qualified, as far as possible, to refer the variations of different systems to their true causes, whether of climate, geographical peculiarities, state of civilization, political events, particular institutions, or of any other description.

There is no difference of opinion as to the reality of most of the variations just mentioned, or their causes. Those which it is the most important to dwell upon, because, being the most insensible, they run the greatest risk of being overlooked or underrated, are the changes by which, in the course of generations, the moral and intellectual identity of almost every nation is necessarily destroyed. In this manner the gradual amendment of the laws of a country should be the best part of the history of its progressive civilization. It ought to be consequent upon it, and to be the surest sign of it. Strangely opposite theories upon the transitiveness or stationariness of laws have been put forward in the discussions on codification. The fact, thus asserted on one side and denied on the other, seems to be regarded by some of the disputants as decisive of that particular controversy. This we conceive to be a most imprudent, and, what is more to the purpose, a most erroneous admission upon the part of the advocates of a code. The extent to which the fact of a gradual, and thus at last an almost total, change in the moral and intellectual identity of a people, affects the value of a code, is a matter only of degree. The fact, if true, will certainly prevent a code from being framed, once and for ever. But it by no means follows that a code may not after all be a desirable compromise in the alternative of difficulties which the question of code or no code necessarily presents. It will only follow that it must be put up in moveable types, not in stereotype. If our extract from Savigny should be thought an exaggerated statement of the necessarily flexible and fluent character of nations, and of their laws, this statement is, in our opinion, much nearer the truth than any notion of immutability, even than that of an immutability liable to be broken in upon only by great occasions, such as Meyer apparently insinuates rather than positively affirms. "In the earliest times to which authentic history extends, the law will be found," says Savigny, "to have already attained a fixed character, peculiar to the people, like their language, manners, and constitution. Nay, these phenomena have no separate existence; they are but the particular faculties and tendencies of an individual people, inseparably united in nature, and only wearing the semblance of distinct attributes to our view. That which binds them into one whole is the common conviction of the people, the kindred consciousness of an inward necessity, excluding all notion of an accidental and arbitrary origin. But these moral faculties require some bodily existence to fix them. Such, for language, is its constant uninterrupted use,—such, for the constitution, are palpable and public powers; but what supplies its place with regard to the law? In our times it is supplied by rules communicated by writing and word of mouth. This mode of fixation, however, presupposes a high degree of abstraction, and is therefore not practicable in early times. On the contrary, we then find symbolical acts universally employed where rights and duties were to be created or extinguished. These formal acts may be considered as the true grammar of law in this period. But this organic connection of law with the being and the character of the people, is also manifested in the progress of the times; and here again it may be compared with language. For law, as for language, there is no moment of absolute cessation; it is subject to the same movement and development as every other popular tendency; and this very development remains under the same law of inward necessity, as in its earliest stages. Law grows with the growth and strengthens with the strength of the people, and finally dies away as the nation loses its nationality. The sum, therefore, of this theory is, that all law is originally formed in the manner in which, in ordinary but not quite correct language, customary law is said to have been formed; that is, it is first developed by custom and popular faith, next by jurisprudence; everywhere therefore by internal, silently operating powers, not by the arbitrary will of a lawgiver."[1] Meyer, on the other hand, from the way in which he expresses himself, gives his readers to understand, that the elements of internal change in the habits of a people, to the degree even in which they influence its customary law, are nothing more than occasional exceptions. "Supposing," says he, "all law to be introduced by usage, it would ensue that it was susceptible of variation when the difference of circumstances in which a nation finds itself, introduces a notable change in its necessities, that is, in its manner of existence. But there is no reason to conclude that a change of this kind is the necessary and immediate consequence of the ordinary alterations naturally resulting from the lapse of time. According to our manner of considering the subject, law, whether it is regarded as an emanation of human wisdom applied to given facts, or is looked upon as the result of the necessary combinations which a state of society introduces, must be unalterable, unless by *reason of some important event*, sufficient either to displace the facts to which the theory has been applied, or to destroy the usage. Custom is unalterable, or it would not be custom; resting on a series of similar facts, it excludes all idea of variation and constant flux. Beginning from the point at which uncertainty ceases, whatever remains stable (notwithstanding slight variations in the species which present themselves) is alone that which can be considered to constitute usage; just as the height of water is calculated by the line which it constantly draws, though one wave may rise above, and another may fall below. The main notion of a law always in movement, always in a course of improvement, and adapting itself to the demands of the moment, and which consequently can never be stationary or regarded from a settled point, is one of those vague conceptions which can only arise in minds pre-occupied by fallacious systems. Law, even customary law, is by its nature invariable and fixed, though capable of being changed when circumstances imperatively require it. But these changes, so far from being of the essence of law and custom, are, on the contrary, altogether exceptions; and it is impossible to have a precise idea of floating laws."[2] This is very unguarded language, quite unworthy of the author of the *Institutions Judiciaires*, and of the good sense and learning which characterize the work in which it appears. Of course, every effect, in the case of laws, as of other things, must have its cause, and that a sufficient one, although not always equally assignable; or it would not have taken place. As far, therefore, as man is unchangeable, such laws as have been once put in harmony with his nature, may be expected to be also unchangeable. But even the class of laws properly belonging to human nature is affected by many causes which produce little or no change in the visible wants and aspect of society; whilst the numerous other laws which follow the bidding of a government, or the temporary tendencies of juridical learning, must change as they change, and often from causes slight enough.

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[1] *Edinburgh Review*, vol. xxxvi. p. 288, *Courts of Ancient English Common Law*, attributed to Sir F. Palgrave.

Foreign jurists, when most favourably disposed to English law, are nevertheless marvellously struck by the poverty and narrowness of most English law-books. Few of our legal writers have thought of any thing further than of compiling and classifying books of practice. Practising lawyers, for the most part, therefore, it may be taken for granted, will consider as quite superfluous almost all and every portion of the labour which we have above required of the makers of the law. Partisans of the historical school in Germany and elsewhere will take their own share of antiquarian doctrine, but be disposed to pay too little attention to the general philosophy of human nature. On the other hand, many of the strict followers of Mr Bentham, too confident in the expanded views opened to them by their master, will think it beneath them to descend from their mountain top, and shut themselves up, as it were, within the paltry bounds of one or two private schools. Now, the several classes thus enumerated are disqualified for the task of legislation, just in the proportion that they are exclusive. Their favourite views are all highly valuable, and the more so because they are to a considerable degree independent of each other. The greater part of all positive systems of jurisprudence were originally built up by means of customs, incidental text-books, and the decisions of courts of justice upon particular cases. After being thus constructed, they were subsequently taught synthetically only as sciences, without having the aid and correction of any real analysis applied to them. Little, therefore, having been ever derived directly from this source, we believe that, in making or amending laws, a philosophical analysis of human nature is of such paramount importance, that without it nothing new and really great will ever be introduced. In this manner alone can a statesman hope to learn what is the standard to which every reform in legislation, except as controlled by special circumstances, should be directed; and by these means alone can he learn how this standard is to be approached. On the other hand, comparative law is a science as well worth studying, and, *mutatis mutandis*, ought to be studied for the same purpose, as comparative anatomy. Religion is the only other subject which has occupied half the same amount of understanding. Besides, no human genius is competent to think out unassistedly a system of law. The legislative and judicial records of mankind are amongst the very highest subsidiary authority for discovering the true principles of human nature upon the questions to which they relate. But, independently of this consideration, the immediate influence exercised by their laws and institutions upon a people, and the way in which all laws and institutions of any standing lean upon and penetrate each other, are practical points of the greatest nicety and weight. An accurate knowledge of them, both of their past history and present condition, in relation to the particular country to which the new legislation is to be adapted, is at least as indispensable as any illumination which the most consummate generalizations of universal jurisprudence can afford. Fortunately, the two methods may be combined. Otherwise, on the supposition that law reforms were to be intrusted to a single jurist, and that accordingly we were obliged to choose our legislator, pure and unadulterated, out of one or other of these opposite schools, we should think ourselves safer among the precedents of the legal antiquarian, than among the speculations of the juridical metaphysician. The precedents have been a part of the real business of life at one time. That is certain. Whether the particular speculations ever will become so, may be a very doubtful matter.

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[1] Savigny *on the Vocation of our Age for Legislation and Jurisprudence.*

[2] *De la Codification en général, et de celle de l'Angleterre en particulier.*

A union of theory and practice can alone secure tolerable legislation. Whether the above schools act herein separately or conjointly, the work, if it is to approximate to the form of reasonable laws, must be the work of a well-practised theorist. The observations of Carmignani upon the mode in which a legislator ought to proceed in getting at his general and subordinate principles, if true of criminal law, must be true with respect to law of all kinds. In the working them out, however, it is clear that the great (perhaps the greater) part of the rules of jurisprudence will have been anticipated and ascertained in what is here supposed the earlier process of investigating the principles of legislation. "If every notion belonging to criminal laws proceeds, as it ought to proceed, from an examination of the qualities of the object out of which it arises, verifying them by observation and experience (and this is the main difficulty), what, it may be asked, is the nature of the principle which such an examination will establish? It will be the most general rule that the human mind can conceive for providing for the wants of that particular object. Will the principle be theoretical or practical? It will be both one and the other: practical because it proceeds from the experience of facts; theoretical because the result of this experience is here converted into a general rule. What, then, shall this principle be called? *A principle of criminal legislation.* But how shall this principle be made to descend from the elevated generalization in which it consists, and be so applied as, in every possible case, to provide for the wants of the object out of which it has first arisen? By observing how best to apply it to the several cases, by considering whether it embraces them all, and how it embraces them, and by fixing the nature and number of subaltern principles which are wanted for facilitating and securing this application. Now, what will be these subaltern principles? theoretical or practical? They will be theoretical, in as much as they are, as it were, a filiation from the first general principle: they will be practical, inasmuch as they are intended to provide for practical cases. How then shall these principles be called? *Rules of criminal jurisprudence.* In criminal matters, therefore, there is not one part theoretical, another practical. There is the science of legislation, or that of establishing criminal law; and there is *jurisprudence*, or the science of the application of the criminal law which has been thus established. Nor can these two branches of knowledge be properly disjoined, the first being a filiation from the second; nor can a proper value be put on this filiation, but by means of analysis."

Whatever mode of legislation is adopted, in case law is ever to be a rational science, it can only be made so by the application of powers and processes, both of observation and generalization, similar to those by which other intelligible sciences have been made. There can be no "high *priori* road;" no assumption, without evidence, of certain general principles or maxims, from and by means of which all doctrines are to be afterwards synthetically propounded. By a philosophical abstraction, what is common in *individual* cases, must be separated and classed, in order to form the *species;* and then the same must be done with what is common to the *species*, in order to form the *genus*. A marked advancement has taken place in legislation at certain periods. But the greater part of this has in all periods been directly owing to an improved analysis of some of the principal facts which enter into legal constitutions, and by a better exposition and understanding of their causes and effects. In this manner alone can the advantages and disadvantages of existing laws be faithfully ascertained. It is thus, to mention two or three instances only, that the legal maxims of former times on heresy and witchcraft, on secret tribunals, torture, extreme or barbarous punishments, have been, one after the other, successively exploded. It has been truly said that "Beccaria would not have produced a revolution in criminal legislation, if, instead of exposing the consequences of sundry mischievous laws, he had restricted himself to an eloquent development of his principles on the *right to punish;* and that the discussions which during the last century arose out of certain celebrated trials, contributed more to the progress of legal science than the *social contract of* Rousseau." Nor is this method the only one really and permanently available for the getting rid of bad laws. It is equally necessary for the framing of good ones. In no other manner can a proper use be made of the materials of existing laws, with a view to the construction of an improved system. This latter enterprise certainly requires a combination of great qualities and attainments. In order to duly correct the English system, for instance, what different capacities must be put in requisition for the task. There will be wanted the learning of Serjeant Hill to collect the materials of a purely professional kind (the most important materials after all),—the philosophical genius of Lord Mansfield to deduce from them liberal and comprehensive rules,—the logic and the caution of Lord Eldon to trace the consequences of the rules to their remotest fibres, and to fix, in one of his exact parentheses, the limits and the exceptions by which particular rules ought to be guarded. The difficulties to be overcome in legislation are great, but not altogether insuperable. It is no answer to a proposition for a thorough sifting into the state of the laws of any country, that any extensive improvement of laws is a difficult undertaking. It is an equally insufficient objection to say, that the best possible system of legislation must, after all, be to a certain degree imperfect. The English nation has inherited a system of laws founded on the force of habit, the authority of prescription, the learning of text writers, and the discretion of judges. Its government must (supposing it to be otherwise competent to the performance of the high trust with which it is invested) be capable of determining whether it has, in point of fact, sufficient means at its command for the introduction of a better system, either in substance, by a substitution, in certain cases, of more reasonable principles; or in form, by the aid either of a general consolidation, or of special codes.

A careful perusal of an excellent chapter by Dugald Stewart, in the first volume of his *Philosophy of the Human Mind*, on "the use and abuse of general principles in politics," ought to satisfy a statesman, that any pains which he may take in this investigation are not likely to be thrown away, at the period which society has at present reached. Reading it, he will the better understand by what causes the science of legislation has hitherto been principally retarded, by what means its successful cultivation may be most effectually promoted, and on what grounds and to what extent we may reasonably hope that the future will consist of something better than a patchwork repetition of the past. The simplifying of legislation means something more than weeding the trash out of a lawyer's library. A single paragraph (we shall give no more from a book which everybody ought to be presumed to know) will serve to show the spirit of his opinions: "In order to lay a solid foundation for the science of politics, the first step ought to be, to ascertain that form of society which is perfectly agreeable to nature and to justice, and what are the principles of legislation necessary for maintaining it. Nor is the inquiry so difficult as might at first be apprehended; for it might be easily shown, that the greater part of the political disorders which exist among mankind, do not arise from a want of foresight in politicians, which has rendered their laws too general, but from their having trusted too little to the operation of those simple institutions which nature and justice recommend; and, of consequence, that, as society advances to its perfection, the number of laws may be expected to diminish, instead of increasing, and the science of legislation to be gradually simplified."

Codification. Codification is one of the many polysyllabic terms which Mr Bentham constructed in order to express in single sonorous words the growing wants of legal science. M. Dumont made it French, and by so doing has made it European. It signifies either the science or the operation of making codes. Modern usage has disregarded the technical nomenclature of the Roman law, wherein the code represented the compilation of that particular portion which was derived from the imperial constitutions. Most persons understand by the word at present no more than an authoritative consolidation, either of the entire body of national law, or of some particular division of it; and this, without distinguishing between the materials used or the form adopted. Five codes on law and procedure, collected from various sources, and arranged systematically in separate paragraphs, constitute the Code Napoleon. In case it is attempted to reduce the English laws to something of a system, the common law and the statute law may be incorporated or kept distinct;—the form may be that of enumerated articles, or of a continuous digest,—the digest may be framed upon either the historical or scientific principle; and yet, in these several cases, the enacted volume would be called, and with equal propriety, a code. Each of these courses has found able advocates. But there is a previous question to determine,—one on which much learning, argument, and passion, have been of late exhausted,—that is, whether, on general principles, a code is of any real advantage to a nation. To know this, it is necessary to know the several characteristics of written and unwritten, or, to speak more correctly, of enacted and unenacted laws. The comparative merits of these two systems will perhaps be better (at least more practically and popularly) stated, by a narrative of the circumstances and the method in which different nations have attempted to solve the problem, and by an examination into the discussions which have taken place in consequence, than by an analysis conducted in a more formal manner.

Municipal law is a rule of civil conduct prescribed by the supreme authority of the state. The legal rule ought in all cases to have the character of a rule. But it may exist, and in point of fact has existed, under very different formalities and presumptions in different countries. It begins in barbarous countries orally, and is necessarily continued in them by oral tradition. It is, however, everywhere committed to the custody of writing, as soon as writing becomes common. By some nations, as soon as it is put in writing, it is embodied into digests; by others it is separated into articulate propositions. Under some systems it is to be got at out of special precedents, by means only of comparison and analogy; under others it is understood to be contained, as matter of necessary inference, in a certain number of definitions and general principles. In the same manner, the rule expressive of the will of society must everywhere be supposed to be invested, first or last, with the sanction of society, speaking by the voice of its supreme authority, that is, by the voice of the legislature. But this sanction may be implied as well as expressed. It exists, although indirectly, in behalf of rules which, if they are made by others, the legislature nevertheless adopts, just as completely as it exists in behalf of those which the legislature has itself originated, and on which, therefore, it set its seal from the beginning. The prudence of an arrangement, by which an intelligent community consents to the surrender of the initiative by its legislature, thus countenancing a wanton confusion of judicial and legislative action, and leaving the law, as it were, all of a heap, comparatively inaccessible and unknown, is a different question. This may, in some cases, have been the least of two evils. But the exigencies of one state of society need not be made the deliberate choice of another. In the mean time, the various laws, pouring in from these different sources, though not equally open to the inspection of the public, are equally recognised by its members, as possessing the authority of law. The abuse, if any, is not transacted in a corner. There are popular usages, transmitted orally from generation to generation by the common report of neighbours, or, as in the city of London, certified by the mouth of the recorder: there are judicial principles, whether laid down by the prætor in general terms, or extracted from the decisions of courts in particular cases: there are the private opinions of learned text writers, such as the jurisconsults at Rome, or as Littleton, Coke, and Fearne in England: there is the uniform understanding of the profession, the *usus fori*, acknowledged even unto the practice of conveyancers. Whilst so many concurrent streams are notoriously feeding and filling the channels of the law, the silence of the legislature is equivalent to its assent. This, most of the advocates of a code are reasonable enough to admit. But it is the legal obligation which is thus impressed upon laws of this description, that constitutes the very ground of their complaint. They insist, that laws so diversified as often to clash, and so latent as often to remain unknown, can never adequately fulfil the characteristic conditions of a legislative rule. They propose, accordingly, that there should be only one form of law,—that of writing; and only one source of law,—that of express legislative enactment.

A complete code, of course, embraces the whole field of law, indeed every subject competent to be raised in a court of justice. Partial codes embrace only legal rights and obligations of a particular description. We shall look at the subject historically in the first instance. If its very principle and *rationale* have been left to be settled almost to our own times, this does not arise from a lack of early precedents; whilst it is to the credit of modern civilization that the argumentative statements latterly advanced on both sides of the case contain the greater part, if not all, of what philosophy can have to say about it. There have been codes of one sort or another in the world from the earliest ages. The title of a legislator was in great request with antiquity. It was an honour of the same order as that of the founder or restorer of a state. We must not, however, be the slaves of splendid names. It is difficult to believe that, on the formation of a semi-barbarous government, it could have the means or the desire of constructing an entire system of positive legislation; still less that it would think of admitting, in the course of its future progress, no laws to pass current but what were either originally produced in that mould, or what were as soon as possible thrown into it, in order that they might be reproduced under its stamp and fashion. This is one of the wants and achievements of wiser times. These ancient codes, instead of being born, like our first father, full grown, were diminutive, feeble births, and left outstanding a much greater mass of customary law. They extended to some few principal subjects only, and were probably not always the sole and exclusive authority even upon them. The proportion between the written law, thus enacted by the legislature, and the remainder of the law, which was derived from other sources, must have varied in different countries at the very commencement of their several societies. The proportion, unequal at first, must have gone on varying still more from age to age. If we should suppose the Twelve Tables, the capitularies of Charlemagne, the code of Alfred, to have constituted nearly the whole of the municipal law of their respective periods, this could not long remain so. The shape which their subsequent legislation might assume would, even in the same state, depend on very different considerations, at different stages of its history; whilst the course which might have been most judicious in one country might be most imprudent in another. Codes then, it is clear, have always existed more or less, of one sort or another, from time immemorial. The advantages and disadvantages also of this species of legislation vary from country to country, and from age to age. In most cases the experiment has been tried, concurrently with other kinds of legislation. This is the state of things which history from time to time necessarily presents. Accordingly a period must arrive in all civilized communities for subjecting the opposite pretensions of contrasted systems to the test of a philosophical and historical discussion. The general question, in what form laws are best authenticated, communicated, and preserved,—the particular question of code or no code in a given country,—are questions which (in whatever way they may be ultimately decided) must sooner or later come to be debated. Of course, we speak of countries where man is in movement, and where the population is sufficiently orderly and prosperous for the laws to spread out and accumulate to their natural extent.

Some persons seem determined to presume every thing in behalf of classical antiquity. It may be suggested therefore, that the evidence of its legislative deliberations upon this subject may have been lost; otherwise the silence of the most celebrated amongst the ancient states is a very suspicious circumstance. If they were never made aware of the necessity of meeting the question, they can have had little or no law on many important subjects. If they were too ignorant or indifferent to make serious provision for a satisfactory determination of it, they must have left their law in an imperfect, incoherent, desultory condition. There is no evidence come down to us from antiquity, that the demand for reducing the whole body of national law to principle and method was ever raised, except at Rome; nor at Rome, for practical purposes, by any body except by Cæsar and Justinian. On this point Cicero gives us the first and almost the only information we possess. His own views are so excellent, that, supposing them to have originated with himself, he must have created a school of law reformers. It is clear that Cicero regarded the writings of the Greeks upon politics and law as purely literary compositions. Under this conviction, he took great credit to himself for writing on law as a statesman. He looked at the laws and the commonwealth in connection with each other; and in all his observations had the Roman institutions principally in his mind. If the legal literature of Greece was too abstract to work with, in what relation stood their judicial jurisprudence? The Greek bar, if it was not of a kind to much embarrass Athenian reformers, must have been still more incapable of assisting to settle the law upon new and improved foundations. Nor is this the extent of the loss. Wherever lawyers are not a distinct and respectable profession, it may be taken for granted that there is little or no law. The jurisconsults of Rome, in the comparative infancy of Roman law, had already become more powerful by their authority than even by their talents. On the other hand, what could be expected of Greek lawyers, such as Cicero describes them by way of contrast: *Infimi homines apud Græcos mercedula addicti qui ministros se præbent in judiciis oratoribus?* Whilst jurists and judges apparently did but little for the cultivation of municipal law in Greece, was the deficiency really supplied from other sources—by popular usages or positive legislation? Cicero has not in this respect a word to say for the nursery of philosophy, literature, and the arts. On the contrary, Rome was in his opinion the only substantial home of virtue, dignity, and empire in all the world. The most vulgar lawyer, admiring his own little manual of practice, and despising the institutions of every other people, could not throw out a more scornful challenge than the comparison he puts into the mouth of Crassus, between the Roman laws and the laws of Draco, Solon, and Lycurgus. *Incredibile est, quam sit omne jus civile præter hoc nostrum inconditum ac pæne ridiculum; de quo multa soleo in sermonibus quotidianis dicere, cum hominum nostrorum prudentiam cæteris omnibus maxime Græcis antepono.*" Nevertheless, all the praise to which the civil law in the time of Cicero seemed entitled, was by comparison only. The black-letter wisdom of the Twelve Tables was losing its interest, except with antiquarians and moralists. In his childhood it had been taught as a sort of catechism to young people. He himself had learned it (*carmen necessarium*), in the way that their constitutional code is a prescribed lesson in the schools of some of the United States; but the practice had gone out of fashion during his lifetime (*De Legibus*, 25). Its old-fashioned authority was just then in the course of being displaced by the successive edicts of the prætors. *Non ergo a prætoris edicto ut plerique nunc neque a duodecim tabulis ut superiores sed penitus ex intima philosophia hauriendam juris disciplinam putant.* The annual code of the prætor could, however, at this period cover but a small corner of the field of law. The rest, such as it was, must have been given over into the hands of the jurisconsult. But the juridical learning of Rome, which was afterwards destined to acquire the character of written wisdom, and become the arbiter of the civilized world, was at that time in a state hardly removed from childhood. Cicero himself, in the oration for Muræna, treats it with the utmost contempt. *Primum dignitas in tam tenui scientia quæ potest esse?* As regarded the forms, *Dum erant occulta, necessario ab eis, qui ea tenebant, petebantur: postea vero pervulgata atque in manibus jactata et discussa, inanissima prudentiæ reperta sunt, fraudis autem et stultitiæ plenissima.* As regarded the substance, *Cum permulta præclare legibus essent constituta, ea jurisconsultorum ingeniis pleraque corrupta ac depravata sunt. Scientia, quæ tota ex rebus fictis commentitiisque constaret.* He finishes by saying, in case where Servius Sulpicius provokes him, that, overwhelmed with business as he is, he will undertake to make himself master of the civil law in three days: *Sapiens existimari nemo potest in ea prudentia, quæ neque extra Romam usquam, neque Romæ, rebus prolatis, quidquam valet. Peritus ideo haberi nemo potest, quod in eo, quod sciunt omnes, nullo modo possunt inter se discrepare: difficilis autem res ideo non putatur, quod et perpaucis, et minime obscuris litteris continetur. Itaque, si mihi, homini vehementer occupato, stomachum moveritis, triduo me jurisconsultum esse profitebor.* Nor was this contemptuous language the artifice of an advocate for oratorical effect. In the treatise *De Legibus* he speaks of the learning of the profession quite as slightingly; and declares that it consists but of mean things, *quæ et scripta sunt a multis diligenter, et sunt humiliora quam illa quæ a vobis expectari puto.* Again, in the treatise *De Oratore,* he states that their writings *neque ita multis literis aut voluminibus magnis continentur. Eadem enim sunt elata primum a pluribus; deinde paucis verbis commutatis, etiam ab eisdem scriptoribus scripta sunt sæpius.* And he adds, *Non dicerem hoc, audiente Scævola, nisi ipse dicere soleret nullius artis faciliorem sibi cognitionem videri.* Up to this period, therefore, notwithstanding the boasted superiority of the Roman law to that of all other nations, to what must the boast be in truth reduced? The foundation consisted of the Twelve Tables, whatever they might be worth. But almost the entire fabric was raised up by means of the annual edict of an annual unprofessional officer, professing to make his laws for the year, and to administer them upon the latitudinarian principles of a court of honour or of conscience. On certain subjects, the additional element of that occasional, partial, and conflicting legislation described by Tacitus, embroiled the fray. These new laws would raise up the debateable examination which Cicero mentions, into the old ones, whether, for instance, they are to be supposed *ipsa sua vetustate consenuisse aut novis legibus esse sublatas.* Now this was the state of the Roman law when Cæsar is understood to have aspired to the character of a legal reformer. The last-mentioned materials, produced by extensive and arbitrary legislation, at the passion and in the interest of opposite authorities, appear, in their complication, their contradiction, and their evil spirit, to have been the greatest grievance. What evidence have we of the measures which he contemplated? Gibbon's imagination seems to have taken wing without authority, when he anticipates on this occasion the avatar of a more than Roman Bentham. According to the rhetorical historian, if Cæsar had achieved the reformation of the Roman law, his creative genius, enlightened by reflection and study, would have given to the world "a pure and original system of jurisprudence." Suetonius is so far from supporting this conjecture, that he expressly restricts the intended amendment of the *jus civile* to the reduction of it within a moderate compass, and to the making out of its immense quantity of laws, a small compilation of those only which were best and most needful; *optima quæque et necessaria in paucissimos conferre libros.* If we suppose Cæsar to have meditated something more than this, it would probably have been an attempt to carry into his legislative digest that logical arrangement, by which Servius Sulpicius had perfected his practice, and by the aid of which Cicero insinuates that he himself had at one time thought of writing a didactic treatise on the civil law. Ought we to conjecture that this intention was really executed in the last books of the treatise *De Legibus?* In that case there is, more than ever, reason to lament their loss. The world would then have known what kind of a code the Roman republic had really the means of making. The passages in which Cicero intimates his views are therefore extremely valuable, as forming part of the history of the progress towards codification. The execution of these ideas would of course have had its own difficulties. But the conception of them places the universal genius of their author in a remarkable light. They afford ample proof of the spirit in which the only Roman philosopher and statesman that we ever read of was preparing the way for the legislative authority of the victorious dictator. Speaking of Servius Sulpicius, in the *Brutus,* he says, "*Existimo, juris civilis magnum usum et apud Scævolam, et apud multos fuisse; artem, in hoc uno; quod nunquam effecisset ipsius juris scientia, nisi eam præterea didicisset artem, quæ doceret rem universam tribuere in partes, latentem explicare definiendo, obscuram explanare interpretando; ambigua primum videre, deinde distinguere, postremo habere regulam, quâ vera et falsa judicarentur, et quæ, quibus positis, essent, quæque non essent consequentia.* To this passage must be joined the notice of the design, which he attributes to Crassus in the treatise *De Oratore.* He says, *Si enim aut mihi facere licuerit, quod jamdiu cogito, aut alius quispiam, me impedito, occupârit, aut mortuo effecerit, ut primum omne jus civile in genera digerat, quæ perpauca sunt; deinde eorum generum quasi quædam membra dispertiat; tum propriam cujusque vim definitione declaret; perfectam artem juris civilis habebitis, magis magnam, atque uberem, quam difficilem, atque obscuram.* More than five hundred years were allowed to pass before this conception was partially executed by Justinian. We say partially; for Justinian's plan falls far short of that of Cicero, although perhaps not more so than the plan of Cæsar would have done, when it came to be reduced to practice. The long interval which intervened, a period equal to the entire duration of some commonwealths, did not of itself render a change in the plan necessary, supposing that Tribonian had felt himself to be equal to the execution. But it brought along with it a necessary change in the materials. There had arisen in the interim a bright age of jurisprudence. The earlier legal authorities were thrown into the shade. The Pandects contain but three names which belong to the republic. Accordingly, the jurist finds as little of the civil policy of republican Rome in the imperial laws which pass under her name, as the antiquarian discovers of the ancient city within the modern walls. The new learning, whatever facilities it might create in one way, added to the difficulties in another. The intermediate five hundred years had been years of legislative despair. Justinian has boasted in his code that he had accomplished that *quod nemo principum, ante nostrum imperium, aut in mentem induci posse aut humano ingenio possibile esse existimavit.* On the whole, therefore, modern law-reformers must not look for much light, either as to the principles or the method of legislation, from the practice and opinion of antiquity. It affects to offer no information of any value except in the instance of Rome. In that instance, the only comprehensive view of which we are in possession was that of Cicero. Defining virtue to be *perfecta atque ad summum perducta natura;* declaring its object to be *naturam sequi et ejus quasi lege vivere;* explaining in this sense the moral philosophy of Socrates, as that by which we are to learn the most difficult of all lessons, *ut nosmet ipsos nosceremus;* he was led on to a similar doctrine in the case of universal law. Universal law is with him a *recta ratio imperandi atque prohibendi,* of which it is the very essence that it must be a *lex naturæ congruens, ad illam antiquissimam et rerum omnium principem expressa naturam.* If the entire treatise *De Legibus* had, by good fortune, come down to us, we should have known the degree to which Cicero, in setting down on paper the detail of his several codes, had ventured to approach to the execution of a scheme of natural jurisprudence. From the ridicule with which he describes the narrowness of all preceding Roman lawyers, even of the Scævolas, he certainly would not have blindly put himself into the same trammels, nor have committed the error of the school divines, in pounding the crystal into dust by infinite subdivisions. *Sed jurisconsulti, sive erroris objiciendi causa, quo plura et difficiliora scire videantur; sive, quod similius veri est, ignoratione docendi (nam non solum scire aliquid, artis est, sed quædam ars etiam docendi) sæpe, quod positum est in una cognitione, id in infinita dispartiuntur.* On the other hand, the practical principles which he professed, bound him to the doctrine, *Spartam nactus es; hanc exorna.* Besides, his particular declarations still remain to us. The course he was about to pursue was to exemplify his creed, that the laws and the government ought always to be in harmony with each other. Regarding the old Roman commonwealth as the best, and intending to give it appropriate laws, he adds, *Ergo adeo expectate leges, quæ genus illud optimum reipublicæ contineant: et, si quæ forte a me hodie rogabuntur, quæ non sint in nostra republica, nec fuerint, tamen erant fere in more majorum; qui tum, ut lex, valebat.* But, more than this, his specimens of codification on the two great heads of ecclesiastical and constitutional law have come down to us in the second and third book *De Legibus.* It is evident from these that he was extremely conservative of the ancient faith on these two important points, and was thus far at least resolved to deviate as little as possible from the beaten track of prescriptive authority into the open and debateable domain of reason. Mr Bentham, we think, could not have been induced to make similar concessions to national vanity or supposed expediency. There would have been some difficulty in persuading him into an apparent belief that he could make the standard of universal jurisprudence in matters of church and state happily fall in with the laws of Alfred and the Saxon code. But Cicero's legislation is Roman throughout. His idea of nature for this occasion, was nature as it existed within the walls and policy of the eternal city; consequently the interest of the work, so far from being universal, is principally the interest which attaches to every thing belonging to Rome, and composed by Cicero. Nor is the treatise calculated to be of greater use, as a precedent, to a codifier, from any advantages of method. And Cicero having disappointed us in the execution of his plan, can we expect the practical official law-reformers to be more philosophical? If the philosopher by profession, when he came to apply his theories, bowed before the *mos majorum,* in obedience to the strict and statesmanlike reserve of his nation, Cæsar and Justinian were not likely to have dreamed of being more latitudinarian. As masters of the world, they did not enter on the subject from any concern about the philosophy of legislation, but in the hope of lessening the burden of the obscure and conflicting laws which they were called upon to administer.

From this brief sketch, two things are evident in the case of the Roman law: first, what required to be done; next, the difficulty of doing it. Its evil condition had become not only perceptible, but so flagrant as to demand a remedy, as early as the time of Cæsar. Suetonius declares that the mischief consisted principally in the *immensa diffusa legum copia.*[1] Livy also and Tacitus repeat it. The complaint had become proverbial. It is admitted, moreover, that no remedy was applied till the melancholy crisis of the sixth century. At this extreme period, another, and soon indeed the only question, had arisen. It was this: Whether civilization should be left to linger out a few more decrepit years in impotent decline, or should come to a violent end at the hands of the barbarians? Whatever may be the imperfections in the legal production of Justinian—whether incident to the age or to the persons—it is acknowledged, not only that the older works on Roman law would hardly have been preserved at all, except for the different compilations of the many contemporary codes of this late season, "but, that it would scarcely have found entrance into modern Europe, had not Justinian's works been among them, in which alone the spirit of the Roman law is discernible." This is the statement of Savigny, generally regarded as the ablest opponent of codification in general, and certainly far from being an indulgent critic to the Justinian specimen in particular. Upon Savigny's own statement, therefore, posterity at least is under great obligations to Justinian for having rescued the floating materials from destruction. Nor can we see that there is any reason for supposing that the desirableness of presenting the materials in an accessible form was not acknowledged even at the time, by his contemporaries. True, there is no existing trace of any experiment towards a code having been made by Papinian, Ulpian, and Paulus, who were not only the three most celebrated jurists, but were also *præfecti prætorio.* But, to infer, that therefore they considered a code as neither necessary nor advantageous, seems a very rash conclusion. Their wishes may have been practically thwarted by a hundred causes, and the evidence of their wishes may have perished a hundred times over. Such is, in truth, the legal history of many countries upon this very point. Savigny admits that, in the time of the classical jurists, "there would have been no difficulty in forming an excellent code." But this being so, it is surely very much to be lamented that the middle period,—that between the infancy and the decline of Rome,—which, for this particular purpose, Savigny accounts the summit of appropriate civilization, was not taken advantage of. The actual generation might not itself be so much in want of a code as the generations that were to follow. But the highest duties of a statesman are partly prospective, in regard to affairs of this description. The opposite doctrine is poor indeed. The immediate generation itself, however, would probably have also been the better for it. Long before this middle period, the learned or technical element must have overgrown the natural or political one. The original confidence supposed to be possessed by a people in their common law must have disappeared. Accordingly, the only remaining problem—that which peculiarly belongs to an advanced stage of society—had already arrived: Ought artificial jurisprudence to be left at large, in all the varieties into which it branches out, or would it best perform its office by being from time to time consolidated, arranged, and authenticated in the shape of positive legislation?

In modern times, this arduous experiment has been tried upon the largest scale, and with the most success, by France. Political circumstances facilitated the legal innovation in a remarkable degree. The fury of the Revolution had made a clear space for the architects of the Code Napoleon to build upon. This was a great accommodation. But the necessity of a reformation, tantamount to a reconstruction of their whole legal system, existed previously, and had been admitted during two or three successive centuries by the most distinguished magistrates of France. Louis XI. "who had it in his mind (though he performed it not) to make one constant law of France, surely might have done well, if, like as he brought the crown (as he said himself) from Page, so he had brought his people from Lackey; not to run up and down for their laws to the civil law, and the ordinances, and the customs, and the discretions of courts, and discourses of philosophers, as they used to do."[1] The only question regarding the Code Napoleon must be as to the manner in which it was executed. None can be raised as to the necessity of a code.

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[1] *In Vit. Cæsar.* c. 44.

Whatever may have been the incompetency of the French councillors of state on this occasion, there is no pretence for alleging that they were not sufficiently French, and that they ran wildly into foreign notions, revolutionary opinions, or abstract theories of human nature and general jurisprudence. For we are informed by M. Dupin, in his *Dissertation on the Life and Writings of Pothier*, that the treatises of that perspicuous and trust-worthy jurist furnished three fourths of that which is by far the most difficult and complex portion of law, the Code Civil. Mr Butler, in a learned note on Coke upon Littleton, disposes of what has been considered by many as one of the great boasts of modern civilization, in a very summary manner. After saying that M. Bernardi thinks that the Assizes of Jerusalem (which, in its present state, is a work of the thirteenth century) is superior to it, he adds, "The Codes Napoleon are five, the Code Civil, the Code Criminel, the Code de Commerce, the Code de Conscription, and the Code de Procedure. It is allowed that the first possesses great merit, that the third is very faulty, and that whatever is good in any of them is rendered almost entirely useless by the last, which has completely confounded and paralysed all the judicature of the country." The practical merit or working qualities of specific laws can be only properly estimated by a native lawyer. The character, therefore, of the different codes, as given by M. Dupin in his letter to Mr Sampson of New York, 1826, is entitled to much greater credit than the comparatively hearsay judgment of Mr Butler. Besides, it carries the evidence down to a later date. It is as follows: "The civil code is the first and best of all; it is clear and methodical; neither too long nor too short; the language of the legislature is noble and pure; the rules are well laid down, and, with the exception of the difficult subject of mortgages, it has met with nothing but approbation, more especially at the present time, since the immoral law of divorce has been struck out. The code of civil procedure has simplified the forms and diminished the expense of lawsuits. No fault is found with it, except in the law form of execution (*expropriation*), the unfortunate though necessary adjunct to the law of mortgage. The commercial code, which re-enacts, in a great measure, the ordonnance relative to maritime affairs of 1681, and that of 1673 relative to commerce, is also generally esteemed. The only exception is the title of bankruptcy, which is equally complained of, both by bankrupts and by their creditors. The code of criminal procedure, and the penal code, are the last, and are those to which the greatest objections have been raised. Despotism dictated them. In many instances state policy has made them her instrument; and liberty has suffered accordingly. Their revision has therefore been demanded even in the Chamber of Peers. But all these codes, such as they are, have been productive of the greatest benefit; they have delivered us from the chaos of our ancient law. Above all, the institution of the court of cassation, which acts, as at a central power, to regulate and check the decisions of all the other jurisdictions, has been of the highest benefit." What then is the result of this experiment in the instance of France? Under the opposition of local prejudices and private interests, it is very possible (as M. Dupin believes would have been the case), that, but for the Revolution, not even a Solon or a Lycurgus, placed on the throne of France, could have been sufficiently powerful to carry an effectual reform. The reform nevertheless would not have been the less wanted. It is absurd to consider the codes as political measures artfully plotted by Napoleon, because they happened to be digested at last under his counsel, and promulgated in his name. The *projet du code civil*, commenced as early as 1793, proves that it was completed to a considerable extent years before the name of Napoleon was heard of. It was owing to the previous discussions on the original propositions of Cambacérès, that the Code Civil was enabled to be brought out at the command of Napoleon, within the short period of four months. The code of France may be, and doubtless is, far short of abstract perfection; but, with all its faults, an immense majority of those who live under it, of those who practise it, and of those who administer it, allow it to have been amongst the greatest of national blessings.

The desirableness of a code of laws for any particular country, at any given period, is a question of fact. Royer Collard sensibly observes, that it is impossible to give, on so mixed and variable a case, one uniform answer applicable equally to all times and places. What may have been clearly good in France may possibly leave a doubtful balance of advantage in England. On the other hand, what it would have been dangerous to attempt a hundred years ago in England, may perhaps be easily accomplished to-day.

Before entering upon the case of England, it may be observed, that the question with regard to a portion of her provincial legislation has been latterly supposed to be placed beyond dispute. Whatever balance of opinion for and against codification may be found to be elsewhere keeping legislation in suspense, there is one part of the globe, namely, British India, in which almost every body conversant with the subject appears agreed. The governor-general in council, assisted both by the most experienced civil servants of the company, and by the judges of the supreme court, has certified that nothing short of a code, however slowly or gradually proceeded in, can meet the necessities of the case. The undertaking is certainly surrounded with many impediments, and will in its execution require at every step consummate prudence. On framing the precise provisions, some twenty different nations, now politically united under the British government, must be treated as distinct nations; varying sometimes in the spirit, frequently in the letter, of their laws. There is one branch, however, that of the criminal law, in which the difficulties belonging to this view of the subject are thought very lightly of. Yet it is the case of criminal law, to which, speaking of what has been called the best code of this kind in Europe, that of Bavaria, Mr Cooper has appealed as furnishing conclusive proofs in favour of Savigny's general objections against the present capabilities of Europe for framing codes. The judges of the supreme court of Calcutta are of opinion that "any one intelligent English lawyer, and one of the civil servants employed in the Nizamut Adawlut, with the assistance of the reports of that court recently published, might jointly prepare a regulation *in a few months*, which would be, for all persons throughout India, *as good a penal code as any now existing in the world*."[2] In the instance of India, the nature of the specific evils to be provided for by a code cannot be more powerfully stated than in the words of one who has been since deputed to the high office of ascertaining and superintending the remedies to be applied. The passage to which we allude is contained in a speech delivered by Mr Macaulay, in the House of Commons, on the last renewal of the charter. The reader will there see, to what complexion unwritten law, that is, law derived from other sources than the legislature, has a tendency to come. A force like that of gravitation is always dragging it in this direction. “ Having given to the government supreme legislative power, we next propose to give to it for a time the assistance of a commission, for the purpose of digesting and reforming the laws of India, so that those laws may, as soon as possible, be formed into a code. Gentlemen, of whom I wish to speak with the highest respect, have expressed a doubt whether India be at present in a fit state to receive a benefit which is not yet enjoyed by this free and highly-civilized country. I can allow to this argument very little weight beyond that which it derives from the personal authority of those who use it. For, in the first place, our freedom and our high civilization render this improvement, desirable as it must always be, less indispensably necessary to us than to our Indian subjects; and, in the next place, our freedom and civilization, I fear, render it more difficult for us to obtain this benefit for ourselves than to bestow it on them. I believe that no country ever stood so much in need of a code of laws as India, and I believe also that there never was a country in which the want might so easily be supplied. I said that there were many points of analogy between the state of that country after the fall of the Mogul power, and the state of Europe after the fall of the Roman empire. In one respect the analogy is very striking. As in Europe then, so in India now, there are several systems of law, widely differing from each other, but co-existing and coequal. The indigenous population has its own laws. Each of the successive races of conquerors has brought with it its own peculiar jurisprudence; the Mussulman his Koran and its innumerable commentators, the Englishman his statute-book and his term-reports. As there were established in Italy at one and the same time, the Roman law, the Lombard law, the Ripuarian law, the Bavarian law, and the Salic law; so we have now in our eastern empire Hindu law, Mahommedan law, Parsee law, English law, perpetually mingling with each other, and disturbing each other; varying with the person, varying with the place. In one and the same cause the process and pleadings are in the fashion of one nation; the judgment is according to the laws of another. An issue is evolved according to the rules of Westminster, and decided according to those of Benares. The only Mahommedan book in the nature of a code is the Koran; the only Hindu book the Institutes. Everybody who knows those books, knows that they provide for a very small part of the cases which must arise in every community. All beyond them is comment and tradition. Our regulations in civil matters do not define rights; they merely establish remedies. If a point of Hindu law arises, the judge calls on the Pundit for an opinion. If a point of Mahommedan law arises, the judge applies to the Cauzee. What the integrity of these functionaries is, we may learn from Sir William Jones. That eminent man declared, that he could not answer it to his conscience to decide any point of law on the faith of a Hindu expositor. Sir Thomas Strange confirms this declaration. Even if there were no suspicion of corruption on the part of the interpreters of the law, the science which they profess is in such a state of confusion, that no reliance can be placed on their answers. Sir Francis Macnaghten tells us, that it is a delusion to fancy that there is any known and fixed law under which the Hindu people live; that texts may be produced on any side of any question; that expositors, equal in authority, perpetually contradict each other; that the obsolete law is perpetually confounded with the law actually in force; and that the first lesson to be impressed on a functionary who has to administer Hindu law is, that it is vain to think of extracting certainty from the books of the jurists. The consequence is, that in practice the decisions of the tribunals are altogether arbitrary. What is administered is not law, but a kind of rude and capricious equity. I asked an able and excellent judge lately returned from India, how one of our Zillah courts would decide several legal questions of great importance, questions not involving considerations of religion or of caste, mere questions of commercial law. He told me that it was a mere lottery. He knew how he himself should decide them, but he knew nothing more. I asked a most distinguished civil servant of the company, with reference to the clause in this act abolishing slavery, whether at present, if a dancing-girl ran away from her master, the judge would force her to go back? ‘ Some judges,’ he said, ‘ send a girl back; others set her at liberty. The whole is a mere matter of chance. Every thing depends on the temper of the individual judge. Even in this country we have had complaints of judge-made law; even in this country, where the standard of morality is higher than in almost any other part of the world—where, during several generations, not one depositary of our legal traditions has incurred the suspicion of personal corruption—where there are popular institutions—where every decision is watched by a shrewd and learned audience—where there is an intelligent and observant public—where every remarkable case is fully reported in a hundred newspapers—where, in short, there is every thing which can mitigate the evils of such a system. But judge-made law, where there is an absolute government and a lax morality—where there is no bar and no public—is a curse and a scandal not to be endured. It is time that the magistrate should know what law he is to administer; that the subject should know under what law he is to live. We do not mean that all the people of India should live under the same law: far from it: there is not a word in the bill susceptible of such an interpretation. We know how desirable that object is; but we also know that it is unattainable. We know that respect must be paid to feelings generated by differences of religion, of nation, and of caste. Much, I am persuaded, may be done to assimilate the different systems of law, without wounding those feelings. But, whether we assimilate those systems or not, let us ascertain them, let us digest them. We propose no rash innovation; we wish to give no shock to the prejudices of any part of our subjects. Our principle is simply this: uniformity where you can have it—diversity where you must have it—but in all cases certainty. As I believe that India stands more in need of a code than any other country in the world, I believe also that there it no country on which that great benefit can more easily be conferred. A code is almost the only blessing—perhaps it is the only blessing—which absolute governments are better fitted to confer on a nation than popular governments. The work of digesting a vast and artificial system of unwritten jurisprudence is far more easily performed, and far better performed, by few minds than by many—by a Napoleon than by a chamber of deputies and a chamber of peers—by a government like that of Prussia or Denmark, than by a government like that of England. A quiet knot of two or three veteran jurists is an infinitely better machinery for such a purpose than a large popular assembly, divided, as such assemblies almost always are, into adverse factions. This seems to me, therefore, to be precisely that point of time at which the advantage of a complete written code of laws may most easily be conferred on India. It is a work which cannot be well performed in an age of barbarism—which cannot, without great difficulty, be performed in an age of freedom. It is the work which especially belongs to a government like that of India—to an enlightened and paternal despotism.”

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[1] Bacon.

[2] Appendix, 5, *Affairs of the East India Company*, 1831.

We proceed to refer in the most summary manner to the domestic history of codification in England. Our observations will relate to what has been performed, and what projected by parliament; and, next, to the principal arguments and objections on both sides out of doors, as we find these elicited in the course of the discussions from the reign of Elizabeth down almost to the present time.

On tracing the course which the English parliament has followed with regard to the defects of English law, its course will be found to have hitherto been marked by its habitual reluctance to great changes. Law-reformers need not shrink from discussion. But, owing to the prevalence of apprehensions and jealousies, and from a weak subservience to personal interests, many of our most useful reforms have been hitherto introduced and passed with as little noise as possible. In point of fact, therefore, English codification, whilst it has taken place to a considerable extent, has only been partial. Some of its experiments have been confined to a mere consolidation and amendment of concurrent or conflicting statutes; others have, by adding the incorporation and revision of the corresponding portion of the common law, gone the whole length of codification on particular subjects. This is admitted, and even approved of, both by Mr Reddie and Sir Edward Sugden; on which Mr Humphreys naturally observes: "Whether the result be termed a code, or be an act, or a series of acts, to amend and consolidate the laws in question, is a mere question of words. Many of our present reforming and consolidating acts, for instance those relating to the customs and the excise, to crimes against property, to trustees and mortgagees under legal disabilities, to bankrupts, to insolvent debtors, are all in effect distinct parts of a code; correcting and embodying all prior laws and rules, whether statutory, judicial, or textuary, on the same subject." The necessity of such a revision, and the mode of making it, are amongst the different matters submitted to the several commissions appointed of late years for inquiring into the different departments of the English law. Important parts of the law of real property will be shortly comprised in express legislative provisions under the recommendation of the real property commission. It is true, that the amendments of the criminal law, brought in under the sanction of Sir Robert Peel, are chiefly examples of the process of statutory consolidation only. But the present commissioners on the criminal law have closed their first Report (1834, p. 35) with a strong opinion that "the combination of a digest of the statute law with that of the common law, into one body of criminal law, is a measure which will tend greatly to the improvement of the jurisprudence of the country. In support of our views upon this subject," they add, "we may observe, that the definitions of crimes, the nature of punishments, and the forms of criminal procedure, originated, for the most part, in common-law principles. But most of the unwritten rules touching crimes have been modified by acts of the legislature, which assume the terms and definitions of the common law. And thus it happens that the language in which these acts are expressed, and the subjects to which they refer, are commonly unintelligible without a knowledge of the common law. The actual law in regard to any particular offence lies partly in the statutes, and partly in the reports and text-books. A reference to a single instance may be sufficient to illustrate our meaning. A modern statute makes it essential to the statutory offence, that it does not amount to an offence at common law, and thus the common-law description of the offence must be referred to for the purpose of ascertaining the limits of the statutory offence. As one digest, therefore, would be imperfect without the other, this seems to be a sufficient reason for uniting them. But it may be further urged, that most of the advantages which may be expected to be derived from a consolidation of the statute law will be attained by combining the two digests into one body of criminal law; and, in particular, the size of a joint digest would be much more compendious than that of two separate digests, and, what is still more essential, the means afforded by methodical arrangement, and by the context, for construing the intention of the legislature with certainty and precision, would, if the two digests were united, be greatly increased."

The above Report was accompanied by a digest of the common law of theft. It is given as a specimen of what may be accomplished in the case of an offence, the decisions upon which are more technical, complicated, and confused than any other portion of the English criminal law. But the public and the profession will soon have the means of judging with greater precision how far this encouraging expectation is likely to be realized. For, on alluding to the subject in the following year, in their Report on the general question of the propriety of a consolidation of all the statutes, civil as well as criminal, they state that they had already made considerable progress "in forming a digest of the criminal law, as well unwritten as written, into one statute, with such partial alterations as might be considered to be necessary or expedient for more simply and completely defining crimes and punishments, and for the more effectual administration of criminal justice." The criminal digest, although it will be the first executed, can only be meant to be a beginning. The example will do much. But, independently of the example, their general recommendation in favour of a statutory incorporation comprehends every case where statute law and common law are mixed up together. It can never be intended to do any thing so anomalous as stop here; as it were solely for the purpose of excluding from the national code that small remainder of the common law, with which it may have happened that no legislative enactments had ever interfered. They mention three plans. The first suggests a mere redaction of existing statutes, by clearing them of whatever in form or in substance is superfluous or obsolete. The second plan proposes to go a step further, and, by consolidation and classification, to bring the whole statute law into a systematic form. But the last goes further still, and advises that, wherever judicial decisions have altered the natural meaning of the words of an enactment, the enactment itself should be forthwith verbally corrected, so as to make its apparent import correspond with its legal effect. On this, their final recommendation, they observe that "no plan of reformation short of remodelling the statute law on the third principle proposed will be co-extensive with existing evils; but that whilst such a reform would be highly desirable, and is in their opinion practicable, its execution would be difficult, would require the greatest caution, and occupy a considerable portion of time." These are vigorous resolutions; and if once duly acted on, the English legislature will soon recover whatever ground it may have lost.

The above statement comprehends nearly all that England has yet performed in parliament upon this subject. Before passing on to the next point, namely, what she has projected, it is proper, in connection with this part of the case, and almost as a portion of it, to notice what the American legislatures have been doing. Their principal legal materials are so nearly identical with, and their circumstances for this purpose so similar to our own, that the question of codification is substantially the same question in both countries.

America, during her short political career, has proceeded in this great undertaking with a remarkable union of zeal and caution. Mr Livingstone had comparatively easy work in Louisiana, which stands alone in this respect. The civil law on which he had to work was already systematized; and the Code Napoleon was, *mutatis mutandis*, ready to his hand. The committee appointed to revise the statutes of New York brings us on English ground. It published, as early as the year 1827, an analysis of a portion of their labours. The charge committed to them was limited to the statute law. But they seem to have considered that they could perform this limited duty very imperfectly, unless they also included in their operation the interpretations which the courts of justice had put upon the statutes. This precedent appears to be precisely that which the English commissioners have since adopted, as far as they have gone. The following passage will explain the views taken at New York. "In attaining the object prescribed to us, to collect together the various provisions on the same subject, to introduce, in their proper places, the successive alterations which had from time to time been made by the legislature, it was obviously impossible to preserve the original language of the statute which was amended, and of the amendments. Parts of sections have been repealed and qualified, and an amendment had again been amended. Enactments are frequently contained in *provisos*, and, in the haste with which statutes are often drawn, the language frequently does not express the precise intent, or expresses more than was intended. In these cases, changes in phraseology were unavoidable. In other cases it became necessary to break up sections containing provisions on distinct subjects, or containing complicated and voluminous details and provisos, in order to distribute them in their proper places, and to arrange them in a natural order. This also unavoidably produced a change in the language. Some statutes which were passed in different years in England, explaining or amending others which preceded them, have been copied into our volumes, with the original acts which were the subjects of amendment, in the very language which had required subsequent legislation. In the same manner, later statutes, which were intended to include prior acts, have been retained with the acts so included. In some instances, by the omission of *preambles*, a different meaning was given to the statutes. In these cases great changes were indispensable. We have not been able to understand why the language of the written law should defy all attempt at improvement, more than the language of any other science, or upon any other subject. It must be susceptible of emendation, by undergoing the process which improves every other production of human skill; and more especially when new interests and new wants arise, which it was not originally intended to embrace. Still, whenever it was practicable, and consistent with the general plan of the revision, we have preferred to retain the important words of the present statutes, unless they have received a settled construction, which would not at once occur to an attentive reader. In these cases the language of the courts has been substituted, whenever it appeared 'more plain and easy to be understood.' In doing so, and in expressing the supposed meaning of various statutes, we have been guided by the decisions of the chancellors and judges of our state, under whose examination almost every statute embraced in this part has at intervals been brought. Those decisions form a body of practical construction and exposition, as honourable to those who made them, as they have been useful. Their utility will be consummated by transferring them into the very body of the statute which they illustrate and explain. And it is one of the results of the arrangement adopted, which gives us the greatest satisfaction, that it has enabled us to incorporate with the law the expositions it has received, and thus communicate directly to those who examine the statutes, for information and government, their sense and intent, as understood by the events. For forty years our statutes have been the subject of professional criticism and judicial exposition. For centuries those borrowed from England have been, in like manner, illustrated and expounded. If at this time a knowledge of their meaning and of their defects has not been attained, it probably never can be acquired. But it is believed that a meaning has been affixed to them, that their discrepancies and incongruities have been ascertained, and that industry and care only are necessary to comprehend that meaning, and to be apprised of those defects. It will, therefore, not be a difficult task to determine whether we have or have not faithfully rendered the existing law whenever we have professed to do so, and whether the imperfections we have supposed to exist are not such, and whether the suggested alterations are or are not necessary and expedient." The Report in the same year, 1827, of the Committee of South Carolina, in favour of a code of the statute and common law, was thought so convincing, that it overcame the previous scruples of their legislature, and its execution was afterwards directed. Mr Wilson's speech must have done much towards converting all whom argument was calculated to convince. According to his recommendation, the common law will be left in the extended form of a digest, instead of being compressed into precise enactments. He sees, like Bacon, a stronger objection to touching the form or language of the common law, than is felt by his professional brethren, the commissioners consulted in England or in New York. It cannot now be long before the two systems, as respectively proposed in New York and in South Carolina, are at work. The old English system remains undisturbed in the other states. Three several methods will therefore be then going on together under nearly similar circumstances. In each instance their practical effect must accordingly be soon observed. Considering the premeditation with which the English legislature proceeds, there can be little doubt but that some definite results, nearly decisive one way or the other, as to the obstacles which the peculiarities of the common law are supposed by some people to interpose in the way of codification, will thus have been arrived at in the United States, before it can be expected that the recommendation of the English commissioners shall come to be acted upon in England. The following is an apposite extract from Mr Wilson's speech: "I would, in the first place, recommend a general and careful classification of the whole statute law, which should be printed and put in the hands of the citizens, with a well-digested index. All acts of a homogeneous nature should be reduced to one act, with reference in the marginal notes to the statute from whence it is taken. The verbose jargon of the acts should be reduced to precise and definite terms. The division should be into chapters and sections, so that a reference to any particular act, or part of an act, would be rendered easy. Immediately after the acts, should be noted the decisions of our courts upon them respectively, and the point ruled should be set down in plain and direct terms, and the point ruled only. So much of the common law as relates to the subject of any particular division, should follow in the nature of a digest. If this plan was well executed, a great deal would be gained. I would require the judges, when any new case arose which was not provided for by the laws, to give it the best determination in their power, which decision should be the law of that case; but it should be their duty to report the case to the succeeding legislature, so that a law might be enacted to meet future cases of the like kind. Thus, if the representatives of the people were true to their trust, they would be enabled to keep the laws *in pari passu* with judicial legislation. It is a fact, not to be resisted, that the judges make more laws than the legislature, notwithstanding the inhibition of the constitution, which specially requires that the three great co-ordinate branches of the government should be kept for ever distinct. I do not think it would be well, and certainly very difficult, to break up the common law into legislative enactments. Lord Bacon has said, that the work which he propounded, 'tendeth to pruning and grafting the law, and not to ploughing it up and planting it again: for such a remove he held, indeed, for a perilous innovation.' I agree entirely with this opinion. No legislative reconstruction of the common law should be attempted, nor would it be requisite. When the digest of it should be made and settled, the statutes classed and purged of their verbosity, contradictions, and uncertainties, a short enactment declaring the code to be the law of the land, as well with respect to the common as the statute law therein contained, would be all-sufficient. Thus, afterwards weeding out all the cumbrous references which, however useful now, as vouchers indicating the authentic sources of the text, would become useless when the text should be established as authentic in its own right; after settling the disputed points, by declaratory or explanatory enactments; and after constituting the digest in its own natural miscellaneous style, it would be practically found to answer every useful purpose of municipal law, better than the most copious enactments. Whoever undertakes the work must guard against the omission of any obscure or straggling rule, enactment, or decision, in any stage of the work. He should take care not only that each enactment, rule, and decision, be included, but that it be inserted in *every* division with which it can properly be deemed to connect itself. In the index, which will accompany each process of the work, the reference to every topic should be registered, not *merely* under *one* appropriate title, but under *all* the titles under which it could reasonably be sought. The marginal abstracts in each enactment, or other article, should be constructed in such a manner as to give to each word its appropriate sense and proportionate value with respect to the *entire* subject to which the particular article so abstracted or analysed may relate. I have thus briefly stated my views of the plan of a code, and suggested some rules to be observed in carrying the plan into effect. I hope I have satisfactorily established the following points:

"1. That our laws are in that crude and indigested state, that they are a mystery to all but those of the profession.

"2. That every nation, in its progress to civilization, has acknowledged the propriety and necessity of reducing its laws to the form of a code.

"3. That the practicability of doing this has been established by every people that have attempted it.

"4. That it is imperative upon the legislative authority to reduce the law to writing, and, when so reduced to a code, to promulgate it in a way so public that every inquiring citizen may know it.

"5. That to punish the infraction of an unknown law, which no ordinary diligence or foresight could have acquired, is against the dictates of common sense, as well as revelation.

"6. That much of the common law of England made of force here, partakes largely of the ignorance and superstition of the age that produced it, and should be abolished by legislative authority."

The next stage in the history of English law reform brings us to the schemes or approximations towards a code, which have been at different periods unsuccessfully debated in the English legislature. From the reign of Elizabeth unto the present day, parliament has never lost sight of the necessity of an amendment of the law more or less extensive. Subject to two exceptions, it, however, never carried its views beyond a revision of the statutes. These exceptions are the criticisms of James I. on the common law, in his speeches at Whitehall in 1607 and 1609; and the directions submitted to the committees which were appointed in the years 1652 and 1653, during the Commonwealth. James, coming from the more liberal and scientific system which Scotland had borrowed from the civilians, and, moreover, a scholar of extensive reading, was naturally shocked at the pedantry, meagreness, and looseness, in which he found the legal system, if it could be so called, of his new kingdom. It was his favourite wish to assimilate, as much as possible, the laws of England and Scotland; a wish since indulged in by Lord Hardwicke and Lord Kames, but equally in vain. If James had succeeded, the project could have been accomplished only by means of a code. The first of the Commonwealth committees was instructed to report generally upon the inconveniences of the law; the second, to consider of a new model or body of it. The first committee, of which Sir Matthew Hale was a member, reported a revised system of law to the house within the year. But it is plain, from the shortness of the time taken, that it can have been nothing more than a sketch; perhaps detailing the general views contained both in his preface to Rolle, and in his considerations touching the amendment of the law, which have since been printed by Mr Hargrave. If the system thus reported had been, as Mr Cooper has described it in his Letters on the Court of Chancery (p. 153, note), *un livre qui contenait un système complet des lois*, it seems impossible that a work of this importance, from the hands of Hale, Cooper, and Rushworth, should have been lost. The reverence which from the first gathered around the name of Hale, and which has since faithfully abided by it, would have prevented such a result. Cromwell attributed his failure, as Ludlow has recorded, and as Mr Bentham rejoices in repeating, to a conspiracy amongst the lawyers, the sons of Zeruiah. But Ludlow was politician enough probably to be well aware of the real reason why "a reformation of the laws was so much desired by those then in power, and, on the other side, as industriously and warily declined and shifted off by many good and knowing men that were respected in those times." At all events, Mr Bentham might have learned it in Hale's fourth chapter "on some things necessarily to be premised, touching the matter, the manner, the persons, and the season of public undertaking for a reformation of the laws." And Mr Cooper would have found there the utmost extent to which any parliamentary report or system subscribed to by Hale at that period could possibly have gone. "The things desired were many of them for the matter good; but the end and design, and the state and condition of things, would not allow of such an undertaking. And therefore those that were solicited to undertake that business rather chose to propound such things only to be done as might be done by the power of courts of justice, but declined whatsoever required a new law to authenticate it." Lord Colchester, in a Report to the House of Commons on temporary and expiring laws, as early as 1796, set forth at length a long array of the several ineffectual attempts which had been made by parliament, year after year, towards a revisal of the statutes. The narrative has been subsequently copied into almost every publication directed to this object. The failure cannot in fairness be laid at the door of the lawyers. As a body, they have been amongst the loudest to complain of the evil of the present system. But, doing so, they would have performed this duty very imperfectly if they had not equally protested against the quackery of insufficient remedies. The cause of the delay which has taken place is sufficiently obvious. In the successful commencement made by the professional commission at last appointed, the grounds of the failure of all former schemes for consolidating the law is at once explained. Parliament is really incompetent to the task. Nevertheless, it would never before, except during the commonwealth, intrust the task to a separate and permanent commission, capable of doing for it that which it was incapable of doing for itself. If James I. could have taken as wise and prudent a course for the law of man as he took with the law of God (see his Letter, in 1604, to the archbishop, for the naming of fifty-four learned persons to translate the Bible), he might have identified his reign with another lasting service to the kingdom. At all events, if the work had been so completed, government would have set an example such as the public is entitled to expect from its superior station. It is true, the work might have been afterwards thrown aside. This has been the case with the *reformatio legum ecclesiasticarum*, the code of which was prepared even at a still earlier period. The labours of Cranmer and the other commissioners who were appointed under 27 Hen. VIII. and 3 Edward VI. to correct the canon law, have ever since been unaccountably neglected, both in and out of parliament. The consequence is, that a great division of the English law, which, properly authenticated and amended by the legislature, might have lived and done the state some service, has lain, for upwards of two centuries, civilly dead, and covered with the dust of contempt and oblivion. The same neglect cannot produce the same consequences in the case of temporal laws. But it does something of the sort; much more, from the silence with which it works, than most people are aware.

Thus much for the puny and abortive adventures, or rather the inroads, made into this unknown territory by parliament itself. English legal literature has been a little more active. This literature begins with Coke and Bacon, and it opens with a demand for law reforms. James I. had, amongst other things, required that there should be one plain penal statute, taking care not to repeal what had been profitably woven into the common law. Of this, Lord Coke promised that, "God willing, somewhat in due time shall be performed." Yet Coke left it to be begun upon by his successors, and they passed it on and on downwards to Sir Robert Peel. The distinction by which Coke acknowledges, that, "to reduce the penal laws into method and order were an honourable, profitable, and commendable work for the whole commonwealth," yet adds, "for the bringing the common law into a better method, I doubt much the fruits of that labour," is a distinction we do not comprehend. It is a distinction the less intelligible in the person of Lord Coke; since it is admitted by a vehement opponent of codification, that Coke's great work, "under the title of Reports, is in truth a most masterly and powerful redaction of each head of law to which his reported cases bring him." In other words, it was "a bringing of so much of common law into a better method." The method and the service of this compilation were so universally recognised, that Bacon, notwithstanding his personal enmity, bears witness that, "to give every one his due, had it not been for these Reports, the law by this time had been almost like a ship without ballast." Lord Bacon was both a philosopher and a lawyer. Great weight is deservedly attributed to his name, wherever it can be enlisted on either side of any argument. From the pertinacity with which the rival parties in this dispute have struggled to grace themselves with his sanction, it might be inferred, that, if his authority be great, his obscurity is still greater. This makes it necessary to examine, with some minuteness, the evidence, as it exists, concerning his opinions. It is admitted by the adversaries of codes, that his Aphorisms, taken by themselves, might mislead superficial readers. But audacious codifiers are remanded, for an answer to them, or an explanation of them, to the proposition made by him to James I., "touching the compiling and amendment of the laws." The precise measures there recommended, it is said, conclusively control the general expressions in his Aphorisms. On a closer inspection, however, it will be found that a comparison between the two leads to no alteration in either. If it did, the rule that, between two contradictory opinions, the latter abrogates the former, would oblige us to enlarge the practical measures of the attorney-general of the year 1613 into conformity with the deliberate maxims of the ex-chancellor of the year 1623; for the Aphorisms were the later work, and were originally published by him in 1623, as a portion of the first part of his *Great Instauration of the Sciences*. Bacon never appears to have wavered as to the necessity of something very like a code. It had been one of the first objects of his legal life, and it was evidently a favourite object with him to the last. Towards the close of the reign of Elizabeth, he thanks her Majesty "for having imparted to him a purpose, for these many years infused into her breast, to enter into a general amendment of the state of her laws, and to reduce them to more brevity and certainty." By way of contributing to this end, he inscribes to the queen a selection of twenty-five out of three hundred maxims. He had set himself upon extracting out of the books the essence as it were of the law, with a general view to the amendment, "in some measure, of the very nature and complexion of the whole law; since particular positive learnings of laws do easily decline from a good temper of justice, if they be not rectified and governed by such rules." The Aphorisms also, although published, for the first time, towards the close of his life, had been amongst the cherished meditations of his early years. They are in truth the self-same supplements which, in the *Advancement of Learning*, as far back as 1605, he had promised, "having begun a work of this nature to propound hereafter." So far from their being in contradiction with the practical measures recommended by him when attorney-general, the measures are applications, and almost translations, of the greater part of them. It is thus shown, that the principles of his Aphorisms must have lain by him, carefully treasured up, as rules to proceed by, for many years. There can be no falser view of the conduct of the great father of experimental philosophy on this occasion, than to suppose that he was a law-reformer in the abstract only; or that his theory was one thing, and his practice another. The measures actually proposed by him are such as, were they to be agreed upon, would bring the dispute amongst reformers within narrow limits. His plan, as laid before James I. is as follows. It consists of three parts, 1*st*, a reforming and recompiling of the statute-law; 2*d*, a reducing and perfecting of the course of the common law as contained in the reports; and, 3*dly*, the further paternal office of certain introductive and auxiliary books touching the study of the law. For the sake of civilians, he has added in his Aphorisms a caution which, addressing a king of England, it would have been superfluous to include in the above practical arrangements. The English system has never acknowledged the direct authority of text writers. Bacon was, however, well aware of the encroachments by which institutional or legal literature had become *authentic* in the civil law, and also of the degree to which both legislative and judicial authority had been thus seriously undermined. Accordingly, he provided against the occurrence or continuance of the evil, in his seventy-eighth Aphorism. But there is further evidence that this great man separated theory from detail as little in law as in philosophy. In his old age, and after his disgrace, that is, contemporaneously with the first publication of the Aphorisms, he was as anxious as ever for the royal permission to realise their application at home. The renewal, at this mournful period, of his offer to the king of a digest of the laws of England, is at once a commentary on the permanence of his opinions, and a testimony of the earnestness with which he held them. "I have commended them," he says on this occasion, "for the matter, but surely they ask *much amendment for the form, which to reduce* *and perfect, I hold to be one of the greatest dowries that can be conferred upon this kingdom.*" There is an air of touching and melancholy self-reproach, joined to a consciousness of the importance of the proposition which he was making, in his concluding words. One could almost imagine that he was looking to this occasion as a providential means by which he might indemnify his country for the scandal he had brought upon its justice, and might redeem in some degree his own judicial fame. " Your majesty is a great master in justice and judicature, and it were pity the fruit of that your virtue should not be transmitted to the ages to come. Your majesty also reigneth in learned times, the more (no doubt) in regard of your own perfection in learning, and your patronage thereof; and it hath been the mishap of works of this nature, that the less learned time hath (sometimes) wrought upon the more learned, which now will not be so. As for myself, the law was my profession, to which I am a debtor; some little helps I have of other arts, which may give form to matter; and I have now (by God's merciful chastisement, and by his special providence) time and leisure to my talent, or half talent, or what it is, to such exchanges as may perhaps exceed the interest of an active life. Therefore, as in the beginning of my troubles, I made offer to your majesty to take pains in the story of *England*, and in compiling a method and digest of your laws, so have I performed the first (which rested but upon myself) in some part; and I do in all humbleness renew the offer of this latter (which will require help and assistance) to your majesty, if it shall stand with your good pleasure to employ my service therein."

The importance attributed, and justly, to the opinions of so extraordinary a man, must be our excuse for going a little more into particulars, in order to show that there is no opposition to be reconciled. Indeed, on the contrary, the Aphorisms of Lord Verulam the philosopher, and the propositions of Sir Francis Bacon the attorney-general, throw light upon each other, and must have been meant to do so. The statute law is divided from the common law in the Proposal. The two are separated in the same manner by Aphorism 61. The Proposal divides the suggestions for the reformation and recompiling of the statute law into four parts. These agree with Aphorisms 54, 60, and 78. The common law he emphatically calls, in the Proposal, by way of distinction from the statutes, the laws of England. The way " to reduce and recompile" them, he conceives, should be laid down as follows: In the first place, he requires a full examination of the judicial records, that they may be set down and registered (rarely *in hæc verba*), so as to show in order of time, not by title, the antiquities of the law. This recommendation coincides with Aphorisms 76, 86. In the next place, he requires that there should be prepared a complete series of the year books or reports from the time of Edward I. to this day, leaving out all such cases as are obsolete, and all such points as are merely idle queries; of identical cases, retaining those only which are best reported and argued, specially noting what cases have been so long militant, that they must be brought before the exchequer chamber or parliament to be set at rest; cutting off from prolix cases all tautologies and impertinencies, and rectifying errors by the record. These recommendations coincide with Aphorisms 60, 72, 73, 74, 75, 89, 91, and 92. A note subjoined to this part of his propositions shows to how late a period he was zealously watching and preparing the necessary means for carrying his scheme into execution. He observes, that, in order to secure competent reporters, he had obtained of the king, *when he was chancellor*, the appointment of two grave and sound lawyers, with a stipend of L.100 a year a piece. This constitution of reporters, he vainly hoped, was thus " settled for all times." These were Bacon's amendments of the past, and his provisions for the present. They might be expected to secure the future also, as far as human prudence can secure it. But Bacon was not content with this. Knowing the frailty of man, and the influence of the innovator time, Aphorisms 55, 56, 57, and 58, recommend, that, from every three to five years, parliament should revise the jurisprudence which had been forming during the interim. For this purpose, special commissioners are to examine into and report upon contradictory decisions, under express directions not to seek out ingenious distinctions for reconciling inconsistencies, so as, *omnia, ut loquuntur, salvare.* These commissioners are to be vested with the power, *ex officio*, of clearing away all obsolete laws, against which even courts of equity are to be authorized to decree. It is a sign of Bacon's good sense in the affairs of life, that he did not embarrass the former measures of immediate urgency by adding this ulterior recommendation to those enumerated in the Proposal. When the law had once been reformed, it might have been introduced at any future time. Bacon's third object, —the official composition of auxiliary books conducive to the study and science of the law,—was a distinct consideration, with which we need not trouble ourselves at present.

Now, the above statement proves two things beyond dispute. It proves, first, that by Bacon's plan, the statute law and the common law were to be kept distinct; that each was to preserve its own ancient speech; and that, whilst he dared not advise casting the law into a new mould, yet both statute law and common law were to be alike consolidated, corrected, and arranged. It proves, secondly, that the entire body and substance of the law, thus consolidated, corrected, and arranged, should be authenticated as law by the express sanction of the state; and that the successive jurisprudence of the country should be constantly kept in order and in view, by being submitted to the legislature for revision at very short periods. English law reformers are contending more for a shadow than for the substance, who are not satisfied with this. Bacon expressly declares, that he does not mean to enter on the general question, whether text law, meaning thereby the articulate propositions of a statutory enactment, is or is not the most advantageous form of legislation. " It is too long a business to debate, whether *lex scripta, aut non scripta*, a text law, or customs well registered, with received and approved grounds and maxims, and acts and resolutions judicial from time to time, duly entered and reported, be the better form of declaring and authorizing laws." Neither codifiers nor anti-codifiers can pretend, therefore, that they have any colour for conjecturing even what was the opinion of Bacon as to the *general* question of code or no code. His argument, in its most universal form, is *particular*, and proceeds upon the dilemmas of a supposed complicated system. But two points are sufficiently clear with regard to the particular case of England. On the one hand, he held the new-moulding of the whole of its common law to be a perilous innovation; and, on the other hand, he contemplated a thorough reconstruction of its form. The method he proposed to employ for the " reducing and recompiling" of the common law, was the very method of a miscellaneous digest which has been lately recommended by Mr Wilson to the people of South Carolina. The difference between the two methods is a difference solely of arrangement. Bacon preferred an historical digest in order of time; Mr Wilson prefers a logical one according to the order of the subjects.

The late Mr Park objected that Bacon's plan, if applicable to the wants of the sixteenth century, was inapplicable to the wants of the nineteenth. The two grounds on which this notion is founded, are equally singular. First, it is surmised that the state of things which made a digest desirable in the age of Bacon, and even of Hale, no longer exists; namely, a want of books in which the law is exhibited with scientific coherence and development. The reign of James I. he observes, knew only of two abridgments, those of Brooke and Fitzherbert. He surely had forgotten the protests of Bacon, Coke, and Fleetwood, against abridgments, or he would not suppose that they were likely to set a high value on this department of our wealth. Only eleven treatises, he adds, were then to be found in a lawyer's library; whereas we have at least two hundred treatises at present, some of them by writers of the highest ability and learning; for instance, Fearne and Butler, Mr Preston and Sir Edward Sugden. The extent to which Bacon would have allowed this statement to be an answer to any part of his recommendation, supposing the works enumerated to be as good as possible, can be carried no farther than this: We may dispense with the composition by authority of auxiliary books, according to his third suggestion. That is all. The poverty of their legal literature, and the superfluity of ours, are considerations which, as far as they apply to the other suggestions—the only ones with which we are now concerned—aggravate the comparative necessity of a code at present. For, what was the real object which Bacon contemplated when he required that, in a system as complex as that of England, the whole law, as law, should be put under legislative sanction? He expresses it in the motto to the first title of his Aphorisms, "*de prima dignitate legum, ut sint certæ.*" This title was the only title that he finished; and, on summing up, he adds that he gave it *ad exemplum digesti reliqui quod meditamur.* Uncertainty, therefore, was in his eyes the great grievance to be removed, and by means of a digest from out of all laws. At the close of the reign of Elizabeth, he had previously declared, that "*the uncertainty of law is the principal and most just challenge that is made to the laws of our nation at this time.*" Can it be said that things are in this respect any better at present? and that it is to the number of its volunteer authors on this subject or on that, that the law of England is indebted for scientific development and coherence? In spite of its two hundred treatises, the uncertainty of the law, its inglorious uncertainty, still continues to be its reproach. In case of this being denied, we answer by the celebrated reply which Lord Eldon made to the representation of the bar, when they requested that he would not encumber his judgments by the declaration of so many doubts. Mr Park's second objection presumes, that a digest, if useful, practicable, and economical, when the reported cases lay in the compass of twenty-five volumes (their number when Bacon wrote), would be useless, impracticable, and ruinously costly, when they amount to somewhere about four hundred, as at present. The reader will judge for himself, whether Bacon would not on this very account have held that the want of a digest of the common law must be so much the more felt. The necessity for a digest of the reports, and for a digest of the statutes, depends on the same cause; and in both cases it must of course rise precisely in the same proportion with their voluminousness. The work, it is true, will require greater pains. The cost would be once only. Money advanced for a saving of time, of thought, and of error, is the best money that can be laid out. But this last objection, as it was already made in Bacon's time, is one which we can reject in his own words, "Sciences must lead books, not books sciences."

Half a century or thereabouts intervened between the propositions of Bacon and those of Hale. Burnet does not notice Hale's service during the commonwealth, on the parliamentary law commission. It had evidently been objected to him as an undue compliance with the times; but how falsely, is proved by his own account of his conduct as a commissioner. He verily believed, he says, owing to the very great earnestness of those who had gotten the power into their hands, "that anything which prudent and knowing men would have offered, might have been then passed for the reformation of things amiss in the law." This belief imposed a consequent obligation upon him. He was bound to endeavour to recover for the public similar advantages, as soon as the political reasons were removed, in consequence of which, according to his own narrative, he had been accessory to the obstructing of the law reforms in the promotion of which he was nominally engaged. Hale was remarkable for the moderation of his opinions, for the superstitious extent to which he reverenced prescriptive authority in government, and for the unrivalled mastery which he possessed over all the mysteries of legal learning. However, notwithstanding the apparent prevarication incident to the awkward position in which he was placed, he was thoroughly honest; and the language which he used after the restoration, proves that he felt the obligation which he had incurred. "The very name," he observes, "of reformation and of reformer has begun to be a style of contempt and obloquy, so that men are as fearful to be under the imputation of a reformer of the law, as they would of the name of knave or fool or hypocrite; on which account its sages dare not meddle with it, but let it live as long and as well as it can in the state they find it. Only, to save their credit upon such occasions, they meddle with some little inconsiderable things, as they set the price upon turnip and carrot seed; but nothing is dared to be done of use and importance." He proceeds to excuse the generation immediately preceding for having left all schemes of legal reformation untouched. But his excuse is coupled with a warning to his contemporaries and their successors. "The truth is, that for the last forty years, little hath been done of this kind: the times were tumultuous and not seasonable for it: and indeed there is the more need, by reason of that intermission and chasm, that somewhat of this kind should be done. Indeed it may justly be feared, that if *something considerable* for the reformation of things amiss in the law be not done by knowing and judicious persons, too much may some time or other be done by some, either out of envy at the professors, or mistaken apprehensions or humours." But little of this "something considerable" has been yet performed. In law reforms the authority of Hale in favour of really substantial changes is not and cannot be disputed. Our present question is, In the execution of his reforms, how far, and in what direction, would Hale have travelled towards a code? Are there sufficient means of learning? What he would *not* do, is abundantly evident, both by his *Considerations touching the Amendment of Law*, and by his preface to Rolle's *Abridgment.* He would have had nothing to do with anything tending to the alteration of the government; nothing that would change the foundation or integral principle of the law; nothing that, by depriving the common law of its particularity, fitted to almost all particular occasions, would have left it to rest in generals. On the other hand, he saw that it was the very nature of the body of the laws, as in the rolling of a snowball, to increase in bulk in every age, till it became utterly unmanageable. "Every age did retain somewhat of what was past, and somewhat of its own, and so carried over the whole product to the quotient. And this produceth mistakes. A man perchance useth one sort of conveyance, where he should have used another. It breeds uncertainty and contradiction of opinion, and that begets suits and expense. It must necessarily cause ignorance in the professors, and profession itself, because the volumes of the law are not easy to be mastered." From the unfinished state of the fragment which Mr Hargrave published, the whole extent and precise nature of the remedies here contemplated by Hale cannot be clearly ascertained; but Mr Hargrave adds in a note,[1] that there is on this subject another manuscript of Lord Hale, which contains "*a chapter on the books both of the statute and common law, with a view to the reduction and digest of them.*" To this extent, therefore, the advocates of a code, it seems, are warranted in appealing to the authority of Hale. It is just what we should have expected from a paragraph in the preface to Rolle, notwithstanding the attempt that has been made to narrow down its general scope to the single object expressed in the concluding words: "It were to be wished," he says, "that some complete *corpus communis juris* were to be extracted for the contracting of the laws into a narrower compass and method, at least for ordinary study." But that Hale had in view the use of the public in courts of justice, as well as that of students in a lecture-room or at a special pleader's chambers, is sufficiently clear by his reference, in the preceding paragraph, to the precedents of the compilation of the laws of Rome by Justinian, and of those of Wales by Edward I.

Latter times ought perhaps not to be harshly judged of for allowing a question, which Bacon and Hale had been unable to bring to any practical conclusion, to go quietly to sleep. At all events, it is no wonder that the law partook of the general incapacity by which the eighteenth century will be known in English history. It was one of those comfortable periods in which, wearied with excitement or satiated with food, mankind seems sunk in a dose, and indisposed to trouble itself with comprehensive views, or the exercise of original powers, or the engaging in vigorous enterprises. Of all departments, the law is that in which the spirit of routine has ordinarily and properly the most undisputed way. The repose was far too profound in England to be interrupted by the various experiments towards a code which, from one end of the Continent to the other, were receiving the patronage of almost every sovereign in Europe. Savigny dates from the year 1746 the continuous series of Prussian legislation. It began under Cocceii with the Code Frederic in 1750. This led on in 1780 to the compilation of the *Landrecht.* The *Landrecht* was promulgated in 1794, and appeared in a revised edition in 1803. The same authority assigns to 1753 the first germ of the new Austrian legislation. It passed through the ordeal of the reigns of Maria Teresa and of Joseph II. and finally issued in the present *Gesetzbuch,* which was promulgated in 1811. During all this time Russia was equally busy, manufacturing and remanufacturing the project which had been commenced as far back even as the time of the father of Peter the Great. The Empress Catherine imagined, or affected to imagine, that she could construct, by means of barbarous deputations from distant provinces, a national legislation. The Emperors Alexander and Nicholas have condescended to take up this splendid scheme as a part of their imperial inheritance. Nicholas, we learn, promises his subjects a new code as the fruits of his law commission (*Introduction by M. Dumont to the Principles of Codification,* 1828; *Annales de Legislation,* t. i. p. 290). The youthful philosopher of Naples was so much the dupe of the first volume of the legislative romance of a Russian code of perfect jurisprudence, as to predict, in 1785, that all the inhabitants of Europe might some day receive their laws *di questa sobria nazione. Il codice di Caterina* (he adds) *mi dà piu di pensare che la sua flotta spedita nell' Arcipelago.* In this foreign panegyric Filangieri had probably in view (as was usual with Voltaire on such occasions) an object nearer home. That object was to reproach his fellow-citizens for the opposition which had stifled the Codice Carolina of Tanucci. Tanucci had been obliged to content himself with a much more scanty reform than what he had wished to introduce. What he hoped that he had secured, is comprised in a decree *Del Raggionamento delle Sentenze,* published in 1774. The end contemplated by the decree was, as far as possible, to compel the old materials to do the office of a code. For this end it was ordered that all suits should be decided according to an express text of law; that, in case of any ambiguity in a particular text, the judges should interpret it in such a manner that the two premises of the judicial syllogism should be founded upon express laws; that, when the legal argument could not be so framed, or the law was altogether silent, the judges should apply to the supreme power of the state for assistance; that the authority of the doctors should be forthwith banished from the tribunals; and that every judge should publicly deliver in writing the grounds on which he founded his sentence. The argument published by Filangieri in defence of this decree, at the age of twenty-two,[2] is, all things considered, fully as remarkable a production as the *Science of Legislation* itself.

It is impossible to guess whether these continental proceedings would have ever attracted attention in England, but for the French revolution. The consequences of that event, and of the exciting discussions on every thing connected with law and politics which it provoked, were soon visible. It is true, that, for a time, reform was by most official persons, and by a great part of the public, considered as only another word for rebellion. But prejudices of this kind necessarily pass away with the alarm. Meanwhile the arguments and the appeals, the philosophy and the personalities, of Mr Bentham, began to attract the admiration of a very intelligent portion of his country, although as yet inconsiderable in point of numbers. They convinced some, and familiarised all, to views on legislation of a much bolder and more original character than had hitherto ever been presented by an English writer to the English public. It was not till 1817 that his papers on codification were first published. Within a year or two afterwards, they were themselves codified into French by M. Dumont. The principles had been sufficiently declared in his earlier works. It was not Mr Bentham's fault that the world received from him principles only. He offered his services as a codifier to America, Russia, Spain, and Portugal, in succession. But, in consequence of his specific offers having been declined, there is extant no plan of a regular code prepared by him, but what is far too general to be of much use beyond the purposes of an outline. Of all Mr Bentham's professional disciples, the only one who has come forward with direct propositions and specimens, is the late Mr Humphreys. In applying himself to the law of real property, and in undertaking to ground it anew on the three titles of enjoyment, transmission, and liability, he at once tried his strength with the most difficult problem in the whole English system. The approbation expressed in the *Edinburgh Review* by Sir Samuel Romilly, of Mr Bentham's general views on codification, and the favourable opinion expressed in the *Quarterly Review* by Mr Butler, of the more special measures of Mr Humphreys, compose, in point of professional authority, as strong a presumption, as practical men can ever expect to have, in behalf of any theory seeking to be put upon its trial. The ablest papers on the question will be found in the several numbers of the *Jurist.* Mr Hammond has laboured only in the comparatively narrow field of statutory consolidation; for instance, on the masses of criminal law contained under the heads of forgery and game laws. Indeed the censure on written laws, which he has prefixed to Sir David Evans's collection of the statutes, is so sweeping in

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[1] Hargrave's *Tracts*, p. 275.

[2] Filangieri, t. v. p. 346.

Legislation.

its principle, that he can scarcely be reckoned amongst the advocates of statutory enactment, much less amongst the advocates of codes. Mr Uniacke, on more than one occasion, has recommended an entire redaction of the law, after the manner of Domat; and, with the assistance of Mr Harrison, he has gone so far as to lay before the public one or two specimens of his method, for example, the chapter of evidence. Mr Twiss appears to have adopted, as he certainly enforced, in his *Enquiry into the means of consolidating and digesting the Laws of England*, that part of Mr Uniacke's views which relates to the correction of the very defective mode, both in arrangement and phraseology, in which the common law and the statute law have hitherto expressed their respective rules. However, suppose Mr Twiss to have to this extent lighted his taper at his predecessor's candle, what does the illumination amount to? Merely to the suggesting, first, that, on digesting the common law, the leading principles and general rules on each subject must be extracted and laid down, with their reasons and diversities; next, that, wherever it can conveniently be done, the general rule should comprise the particular cases which it affects; but, where that cannot be attained, the particular cases should be placed in supplemental sentences. A similar course is recommended for adoption on consolidating the statute law. Instead of throwing all the particular cases into one integral and necessarily involved rule, the general rule ought to be extracted in a clear phrase by itself, and then a subsequent enumeration of the cases which fall under it should be adjoined. These suggestions are such as Mr Symonds would admit to be very reasonable. There is nothing in them, however, so ingenious or characteristic as to make them the peculiar property of any individual as their inventor. An inconceivable irritability seems to attach to almost all writers who have meddled with the subject, whether as friends or as foes. Otherwise, Mr Uniacke might have expected to accept gratefully a more lucid and elegant exposition of his argument than he had given to it himself. Mr Twiss expressly disclaimed any pretence to original invention. His particular object was simply to present the respective measures which better authorities had recommended, in such a consecutive order and relation, that each would be complete and available in itself, independently of those others which might or might not be executed after it. This he has done in a business-like sketch of the scheme by which it might be best managed; and, next, by pointing out what would be a proper constitution of the body which was to be intrusted with the work. The present law-commission may probably think that their own body is as well constituted for the purpose, as either the body proposed by Lord Stanhope in 1816, or the one proposed by Mr Twiss in 1826. Nevertheless, it may be well worth their considering whether it would not be advisable, in the execution of their task, to proceed step by step; securing, first the classification, next the consolidation, and lastly the re-enactment of the statutes previously consolidated; and, secondly, proceeding, first to the classification of the unenacted law, then to the digesting this with the former, and lastly to the imposing the legislative authentication upon the whole. In this manner, let the work proceed fast or slow, stop in the middle, or advance to its termination, every movement must tell, and not an iota of the labour so expended will be thrown away. We cannot dismiss this catalogue of names without expressing our respect for the zeal and foresight of the private lawyers, who, notwithstanding public indifference and public obloquy, have not feared to anticipate their age, and sow the seeds of a harvest which posterity will reap.

In England nobody has taken a part in this discussion who has not admitted in the most unqualified manner the absolute necessity of very considerable amendments in the English law. To the legislative alteration of certain defective principles the late Mr Park was ready to consent: further, however, he could not go. Acknowledging the evil of our judicial literature, and its inevitable tendency to become worse and worse, he could not bring himself to adopt any of the means by which codifiers seek to counteract it. Mr Cooper does not merely allow, he insists that a great deal has to be done.[1] Nor would he stop with Mr Park. We see no reason for supposing that he would keep out of the crucible of reform, as needing no amendment, a larger portion of the common law, than the most determined codifier also might exclude. His quarrel with the codifier begins with the further question, What are the most appropriate measures by which these necessary amendments should be effected? On this point, however, we have nothing more definite from Mr Cooper or from Mr Park than their contemptuous repudiation of a code. They have not divulged their secret, nor breathed a syllable, enabling us to judge of the character and efficiency of the reformatory measures which they propose to be substituted instead. In case no other measures are devised, or none which are adequate, what alternative remains for the English nation? We have to choose between the state of the law as it exists before the code, and the state of the law as it will exist after it, according to the best opinion we can form of an untried future. In other words, we have to choose between the suffering from the actual disorder, and the suffering from the proposed operation. Competent persons differ in opinion, which way the balance inclines at the present moment. It is certain, however, that a burden is daily accumulating in the scale which represents our actual system; a burden heavier than our fathers have borne before us, and heavier than we or than our children can ever bear. The crisis in the legal history of England, foreseen by Mr Hallam, "when our laws, like those of Rome, must be cast into the crucible," is at hand. It is a responsibility which her statesmen and her lawyers may well be excused for regarding with apprehension; but it is one for which, when it can no longer be safely avoided, it is their duty honestly to prepare. The important questions are, Is the time arrived? Are we equal to the occasion? How should it be done?

The objections mooted by Mr Cooper and by Mr Park range at a wider distance. Agreeing with the partisans of codes on the nature of the present evils, they persist nevertheless in declining to entertain the question of a code. This appears, therefore, to be the proper place for shortly stating the grounds of their respective objections. They have paid considerable attention to the subject, and have written upon it with much of learning, and still more of warmth. Their writings, however, do not, if we properly understand them, contain the proportion of well-directed and determinate reasoning which an argument of this magnitude demands. Mr Cooper can scarcely expect that persons reading for information would be satisfied by general assertions of the following description. A code will plunge us in uncertainties; it will multiply litigation; it will lower the price of land; it will put us back to the condition of an infant people. Codes, instead of being called for by the people at large, or instead of having been the result of free national legislation, have been almost always the gifts of despotic princes; codes are not wanted since the multiplication of the copies of law-books at a reasonable price by means of printing; parliament could never induce the best men to abandon the more profitable employment of the bench and of the bar, in order to take their intellectual share in so very precarious an adventure, &c. These are dogmatisms, which, we candidly confess, go with us for very little; yet, we hope, for all that they are really worth. But some of Mr Cooper's letters contain a great deal of very valuable instruction. We allude to the parts where he endeavours to distinguish between the actual condition of law and society in England and that of other countries, for the purpose of showing what may be the comparative exigency for, and what the probable efficiency of, an English code; again, when he points out the imperfections of the principal codes which have hitherto been devised; but, above all, in his endeavours to reduce within reasonable bounds the extravagant representations of what any code can possibly effect towards restraining law-books and lawsuits in an intelligent and flourishing society. Law reformers are not a kind of people to be charmed or intimidated by declamation. Nevertheless, all whom he can have intended to address would have been thankful for a complete and correct analysis of the advantages and disadvantages, in general, of legislating by way of codes, as compared with other systems of legislation. They would attentively listen to an historical statement of the advantages and disadvantages which had been practically experienced by particular countries on the adoption of codes. They are also fully aware of the use of judicious prospective calculations. If a similar balance-sheet, adapted to the case of England, had been thoughtfully prepared for them, they would have carefully studied its probable results, before permitting the experiment to be tried upon the existing elements of English law, and in the atmosphere which surrounds it. Towards this, Mr Cooper has done something; and so far he has done wisely and well.

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[1] *Lettres sur la Cour de la Chancellerie*, 1830, Appendix, p. 382.

Mr Park, in his *Contreprojêt to the Humphreysian Code, and to the projects of Redaction of Messrs Hammond, Uniacke, and Twiss*, took up a position of his own. His circle appears a wide one; but it is in fact almost a single point. He abstains from entering into the general discussion for or against codes. He has been informed that Savigny had settled the general question in the negative. The province to which he confines himself, is that of showing that, whatever may become of the argument in other countries, the law of England is a law of precedents, dependent upon established maxims and rules of adjudication, and framed upon some peculiar principle of its own. He calls it the principle of systematic coherence and dialectic deduceableness. To this character he conceives codes or redactions must be alike fatal; for they must equally (as he opines) withdraw the law as a science from the mastery of its practitioners, and introduce a corresponding uncertainty into the decision of its judges. We fully admit the judicial origin of the greater part of the English law in times past. We even believe that the most important hints, and perhaps the most important materials of law and legislation, must continue for the future also to come out of courts of justice. Yet the question recurs, What possible good can the public derive from the above theory of assumed coherent principles, which the public cannot equally possess when the actually existing law is transferred into a code? Mr Tyrrell observes, that a considerable shaking of precedents must occur when principles are taken up and separated from their context. We agree, that upon transplanting maxims, a little time will be wanted before they take root kindly in the new soil prepared for them. But that is all. Besides this temporary annoyance is different, in different systems. In some, a single thread cannot be loosened but the whole web is ravelled up at once. In others, the system has grown up piecemeal and in the dark: it has started originally from no more comprehensive principle than the circumstances of the moment: it has spread by individual accretion only: it is kept together by cohesion rather than coherence. In this case, whatever principles and rules are hammered out at last, or rise up under the moulding influence of time, they exist there in so arbitrary and conventional a state, that the percentage of temporary inconvenience which may accompany their removal to a more favourable position must be cheaply purchased. If there are no principles and rules to be discovered, whatever precautions may be taken in dealing with a mere chaos of nominal authorities, is tenderness misplaced. But granting them to be in existence and in operation, it is impossible to believe that they cannot do their work as effectually in a code, as whilst they are scattered up and down in the floating repository of voluminous reports. Of the two presumptions, which is the more probable,—that the qualities of systematic coherency and dialectic deduceableness will be the natural accompaniments of a system which branches out from sound general principles, however originally derived, into plain didactic regulations? or that they will be the artificial consequences of a fictitious system, built upon an interminable series of specialties, called precedents; especially when it is considered that the very element of case-law involves so many points of variation, that, on any occasion, nobody can be sure that he is not exercising his logic upon a different set of precedents, or upon those specialties in the self-same precedent, which, after all, the judge may not consider as properly applicable to the case? There are embodied in almost every precedent, opposite analogies, with sundry hanging threads attached to them, any one of which a judge, who is a little capricious, may lay hold of at his pleasure.

In regard to the English system, Mr Park considered himself unquestionably safe upon ninety-five per cent. of the advice which he gave his clients. Mr Preston informed him, that upon an inspection of his opinion-books for thirty-three years, an average of not above three per cent. went on to judicial litigation. Here, exclaims Mr Park, are 33,000 cases intercepted in their course towards the tribunals. Now, we know why it is that codified France requires 5000 judges. Before any such use, to the disadvantage of the Code Napoleon, can be made of this closet-calculation, we must have before us the average of error and litigation incident to the consultations of French lawyers of equal eminence. Mr Park appears to imagine that there are no cases disposed of in this quiet way under codes, and that the French tribunals are all occupied in dispatching what English practice would have anticipated out of court. In trying the merits of the question—code or no code—by experiment, the judicial systems for the administration of each must be taken to be equally good; and the code must be something steadier than "a heaving ocean of jurisprudential ethics?" If it be answered, that the supposition of this inferiority in the judges and in the code is a part of the case, there is no use in continuing the discussion, except to say that the supposition is a pure assumption. It is one, too, as little warranted by fact or probability, as the opposite theory of Mr Bentham, whose delight it was to anticipate the golden age, when codification should have deprived opinionists of their bread. The statistics of litigation in different countries have as yet been far too imperfectly observed, to allow of our forming even a guess as to what would be the result, in this respect, of a comparison between France and England. We have no reason to believe that the return would be unfavourable to the working of the Code Napoleon. But the advocates of codification in general, still less of English codification, are not bound to put their case on the issue of any single comparison. The case of England is too peculiar to be governed by the success or failure of any of the codes of modern Europe. The peculiarities, as they are acknowledged to prevail up to our own times, are sufficiently striking. The testimony of Mr Park's favourite authority, Mr Preston, is decisive upon a subject, too, which, above all others, has exercised and exhausted for ages the learning of the English bar: although it seems, nevertheless, that it had been little studied as a science. "Till a recent period, the knowledge of this branch of the law (that of real property) had received a very moderate share of attention as a science. The rules of property were scattered in books on the subject of the laws in general...The knowledge of these rules was not to be acquired with ease. Much perplexity and confusion must have been experienced by the student, who, out of many disagreeing opinions equally specious, was to collect the one best supported by principles; on whom it was incumbent, from a number of particular cases, to propose to himself, or to extract, a general rule, and to mark the cases which were not within the reason or the scope of the rule. This was to be accomplished only by discriminating the very minute circumstances, by which cases within the reason of the rule were to be distinguished from those cases which were beyond or beside that reason." If this were the case, till very recently, with the most elaborate and systematic part of the law, assuredly the doubt which sensible persons will entertain, is not so much, whether a code upon this portion of the law were wanting, as whether this particular portion were in a state ripe enough to be incorporated into a code. It is trifling with men, after a statement of this description, to tell them that the uncertainty is not in the law, but in the method of discovering it; that method being the only one you have. When a precedent is overruled, how is a suitor the better off for being told by Blackstone that there has been no change in the law; but that all that has taken place is, that an imposition has been unmasked, and a certain amount of supposititious law displaced to make way for the rightful interpretation. The law is a practical science. What can be that marvellous perfection which is consistent with being obscure, unmanageable, and inaccessible? What would be said of a musical instrument, which, from its size and complication, required a Polyphemus to play upon it? In law, as in morals, there must be a mistake somewhere, when what is called the theory is one thing, whilst the practice turns out to be something else. The desire of anticipating every possible exercise of discretion, through the instrumentality of refinements and subtleties, and by means of an enormous magazine of case-law, only opens the door to discretions of another class. We have admitted that there is a certain inconvenience attending the most necessary changes. On constructing a code, a short intermediate period must elapse before it settles, as builders say. During this interval, however, it is some compensation, that, even from the first, the decisions will keep closer and closer to the merits; and that, according as the doubtful points become gradually fixed, they will be fixed on foundations which will not fail us. But Mr Preston says, that the law of real property has latterly acquired the character of a science. Let us take his single treatise on Merger. Its author calls it elementary. But it is considered as one of the most profound books in an English law library; and one must hope, for the sake of the English community, whether clients, practitioners, or students, that it is justly considered so (or what is to become of them under such a system of jurisprudence?) when we are told by its author that the volume "contains at least 3000 propositions on subjects of every day's occurrence." Whoever may be called upon to codify the law of Merger, will owe much to Mr Preston. Books of this class represent at the present day the writings of the jurists of the third century under the Roman law. They must at last have to be put to the same honourable use. Their authors are our Ulpians and Papinians, preparing the way for the Tribonian who is to come. Mr Hallam has said, that it will be a disgrace to the nineteenth century if it should not produce one. We pray, then, for better things.

Does England mean, as the master and the maker of English law, to fall back into the wake of the United States? If not, we may have no great time to lose. We have already shown how far New York and South Carolina are in advance. But the division of opinion upon this point, which exists in some quarters amongst our transatlantic coparceners in the common law, as well as amongst ourselves, seems with them to be more entirely a question of time, and not of principle, than is yet the case in England. In the meanwhile, the turn which it has taken there, appears to be both rapid and singular. It was only the other day that Mr Madison scarcely thought the offer of a code from Mr Bentham worth the trouble of acknowledging. The common law was a thing too sacred and tender to be touched. But that delicacy is over. Law, framed as the common law has been framed, will want reforming at some time. The only doubt is, whether lawyers of the years of our Lord 1823, 1836, are born too late or too early for the Herculean task. Mr Sampson has great merit for having taken the lead in disabusing his countrymen of their blind idolatry of the common law. He proposed, in his discourse of 1823, an immediate revision of it. His view would seem to be, that nothing is to be got by waiting till it gets worse. On the other hand, Mr Duponceau, in his *Dissertation on the Nature and Extent of the Jurisdiction of the Courts of the United States*, only begged of reformers, the year afterwards, to have a little patience. If they refrained a little longer, the judges would have substituted for the still remaining errors of these old Sybilline books more solid principles of jurisprudence, and we should have a common law worth codifying. "It is much better that things should remain as they are until the common law shall, by successive improvements, have attained its highest degree of perfection, and then it will be time to reduce its principal provisions to a text; for the details must always be left to the sound application of the principles of the system, as it is impossible for any legislator to foresee all the cases that may possibly arise. I think, however, that we are sufficiently ripe for a national system of *commercial law*, and therefore I have ventured to express a hope, that congress will exercise the powers which the constitution has given them upon that subject." The particular question of time was submitted in 1826 to Mr Dupin. His answer, although diffident in form, is positive enough in substance. "As to the precise point of whether your country is ripe for such a digest, I do not undertake to decide it. I confess that, if our codes had been digested in the fifteenth, or even in the sixteenth century, they would not have possessed by any means the qualities which now recommend them. To produce them, it was necessary that the labours of jurists, the decisions of magistrates, and the experience of all classes, should have brought the science, as it were, to a certainty. Are you yet arrived at this point? You can answer this better than I can. I admit the force of the reason given by some of your adversaries, that a badly made law would tie up the judges, and prevent them from improving the system by degrees. But what are these improvements which they suppose must result from the liberality and the wisdom of the judges, but the exercise of arbitrary power? And is not this attended with most serious inconveniences? Bacon has well said, *optima lex est quæ minimum relinquit arbitrio judicis, optimus judex qui minimum sibi*. And yet there are persons in your country who would wish the judges in reality to be legislators. Can your nation, so enlightened in matters of politics and government, be only in arrear in matters of civil and criminal law?" Under these circumstances, the scruples of Mr Duponceau and his friends may perhaps be already overcome; for he has declared that he thinks "the common law is susceptible of being carried to the highest degree of perfection, and that he believes the honour of producing the result is reserved to the jurists of the United States." It is impossible, therefore, to tell with what rapidity this process may be taking place, and when the propitious hour may happen to arrive. English jurists have nothing to wait for on either of these opposite suppositions. On the argument of Mr Sampson, they ought not merely to be content, but to make good speed with their actual materials for legislation. The rubbish gets deeper and deeper every year. According to the expectation of Mr Duponceau, they have nothing to stay for. The promised contributions to the perfection of our old vernacular jurisprudence are not to come from us. Unless, therefore, we mean to wait for the American Tribonian, we should do well, without more delay, to set about providing ourselves with a Tribonian of our own.

Mr Justice Story, in his *Discourse on the Past History, Present State, and Future Prospects of the Law*, delivered about the same period, looks on the mother country more favourably. He admits her into partnership in this heroic work. We cannot, therefore, do less than quote his advice. "The mass of the law is accumulating with an almost incredible rapidity, and with this accumulation the labour of the students, as well as professors, is seriously augmenting. It is impossible not to look without some discouragement upon the ponderous volumes which the next half century will add to the groaning shelves of our jurists. The habits of generalization which will be acquired and perfected by the liberal studies which I have ventured to recommend, will do something to avert the fearful calamity which threatens us, of being buried alive, not in the catacombs, but in the labyrinths of the law. I know, indeed, but of one adequate remedy, and that is, *by a gradual digest, under legislative authority, of those portions of our jurisprudence which, under the forming hand of the judiciary, shall from time to time acquire scientific accuracy*. By thus reducing to a text the exact principles of the law, we shall, in a great measure, get rid of the necessity of appealing to volumes which contain jarring and discordant opinions; and thus we may pave the way to a general code, which will present, in its positive and authoritative text, the most material rules to guide the lawyer, the statesman, and the private citizen. It is obvious that such a digest can apply only to the law, as it has been applied to human concerns in past times; but, by revision at distant[1] periods, it may be made to reflect all the light which intermediate decisions may have thrown upon our jurisprudence. To attempt more than this, would be a hopeless labour, if not an absurd project. We ought not to permit ourselves to indulge in the theoretical extravagancies of some well-meaning philosophical jurists, who believe that all human concerns for the future can be provided for in a code speaking a definite language. Sufficient for us will be the achievement to reduce the past to order and certainty; and that this is within our reach cannot be matter of doubtful speculation. It has been already accomplished, in a manner so triumphant that no cavil has been able to lessen the fame of the authors. The Pandects of Justinian, imperfect as they are, from the haste in which they were compiled, are a monument of imperishable glory to the wisdom of the age; and they gave to Rome, and to the civilized world, a system of civil maxims which have not been excelled in usefulness and equity. They superseded at once the immense collections of former times, and left them to perish in oblivion; so that, of all ante-Justinianian jurisprudence, little more remains than a few fragments, which are now and then recovered from the dust and rubbish of antiquity, in the *codices rescripti* of some venerable libraries. The modern code of France, embracing as it does the entire elements of her jurisprudence, in the rights, duties, relations, and obligations of civil life; the exposition of the rules of contracts of every sort, including commercial contracts; the descent, distribution, and regulation of property; the definition and punishment of crimes; the ordinary and extraordinary police of the country, and the enumeration of the whole detail of the civil and criminal practice and process; is perhaps the most finished and methodical treatise of law that the world ever saw. This code forms also the law of Holland, and, with comparatively few alterations, has been solemnly adopted as its fundamental law by the state of Louisiana. The materials of it were to be sought for among an almost infinite variety of provincial usages and customary laws, and were far more difficult to reduce into system, than any which belong to the common law. It is left to the future jurists of our country and England to accomplish for the common law what has thus been so successfully demonstrated to be a practical problem in the jurisprudence of other nations, a task which the modest but wonderful genius of Sir William Jones did not scruple to believe to be within the reach of a single mind successfully to accomplish."

Marvellous pains are taken, and with marvellous success, to make people misunderstand each other, to exaggerate the importance of the minor points upon which they differ, and to slur over or forget the far greater matters on which they are agreed. From the way in which Mr Bentham's adversaries represent or rather misrepresent his opinions, their readers would not suspect him to have stated that there are three stages of legislation, of which it is the last which will terminate in a code. This view, or something extremely like it, is also that entertained by Savigny. In the muster-roll of names, it is repeatedly mentioned, that Thibaut, Feuerbach, Pfeiffer, Almendigin, Gonner, and others, have written in favour of codification; Schlosser, Hugo Schrader, and others, against it. We have had no opportunity of seeing the particular works alluded to. But we comfort ourselves in our ignorance of the fact, by the probability that the real bearing of their debate is confined to Germany; since this is true, even in the instance of Savigny's celebrated essay upon *The Vocation of our Age for Legislation and Jurisprudence.* His very title significantly fixes the object of the work. It is addressed to the present age. This ought to have been enough to put honest readers upon their guard against drawing conclusions beyond the intention of the author. On reading it, it is plain that his general observations have a positive and limited reference, as much as his special criticisms. By no possibility can they be reasonably applied to any country but to one which is placed by its political circumstances, by the character of its laws, and even by the state of its language, as well as of its legal attainments, in the particular predicament which the whole of his argument assumes. M. Meyer has inscribed to Mr Cooper a very able essay, which we have cited before for another purpose. We agree with him in the greater part of the opinions which he has expressed, and altogether in the conclusions in favour of codification at which he has arrived. But in criticising Savigny, he appears to us, in attacking him, to have mistaken occasionally the extent of this admirable scholar's argument, equally almost with the English writers, who, without discriminating very accurately their right to claim it, have sought for shelter under his name. Savigny's essay, at the time it was published, was a political pamphlet against the French. Prussia had just cleared her soil of their bayonets, and her tribunals of their laws. Körner's songs are not more the burst of triumph from a soldier at their military emancipation, than Savigny's pages are the exulting gratulations of an enthusiastic lawyer on the recovery of his country's legal freedom. The work did and does infinite credit to his patriotism. His statements, too, according to our understanding of them, we can have no difficulty in taking upon his own authority. The inaptitude of Prussian lawyers to legislate for themselves at present may be true to the letter. Trained up under the minutiæ of the *landrecht*, it is natural to expect that this should be the case. Meyer ought to have borne these circumstances in mind; in which case, he would have made more allowance for the local and temporary spirit in which the argument of the Prussian jurist is not only conceived, but actually expressed. There are, however, essential differences in the legal principles and the habits of these two writers, and in their general drift of thought. Savigny is an ardent advocate of the historical school of law; Meyer of the pragmatic. Savigny looks to the traditions from which laws are derived; Meyer to the express sanction by which they are imposed. But when Meyer says, that if the system of the historical school be well founded, not only are written codes and positive legislations chimeras and impossibilities, but every attempt to arrive at them must lead to serious inconveniences, and adds, that Savigny thinks so too,—the observation is much too sweepingly worded. With the exception of a few bitter sneers at France, Savigny argues the case of Germany only. The single point he makes, is its incapacity at present to frame a code of any real merit, owing to the defective education of its lawyers, and the insufficiency of its language. His objection includes every species of legislation and jurisprudence; and only specifies codes in particular, because they are more prominent and arduous than the rest. Instead of saying that a good code is universally impracticable, he says just the contrary. Nay, he goes the length of saying, that by means of historical law-schools, well conducted, Germany itself will become qualified to frame one. But whether it would be prudent or not to do so; in other words, which system would be preferable, that of enacted or unenacted laws; is a further point on which, like Bacon, he abstains from intimating an opinion. It is no imputation on Savigny to state that the essay was written under great political excitement, and with the professed object of beating up a crusade against denationalization. Under these circumstances, we feel that it is not presumptuous to surmise, that if he could have honestly pronounced an opinion universally unfavourable to the adoption of a code, he would not have withheld it.

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[1] Bacon says *short.*

The following are the passages in which Savigny contemplates the euthanasia of the historical school. The first regards the substance of the law, as it will have been created by legal talent: "Let jurisprudence be once generally diffused amongst the jurists, in the manner above mentioned, and we again possess, in the legal profession, a subject for living customary law, consequently for real improvement; the practice of our courts of justice is but a clumsy substitute for this customary law, the practice of the law-faculties the clumsiest of all. The historical matter of law, which now hems us in on all sides, will then be brought under subjection, and constitute our wealth. We shall then possess a truly national law, and a powerful expressive language will not be wanting to it. We may then give up the Roman law to history, and we shall have, not merely a feeble imitation of the Roman system, but a truly national and new system of our own. We shall have reached somewhat higher than to a merely sure and speedy administration of justice; that state of clear perceptiveness which is ordinarily peculiar to the law of young nations, will be combined with the height of scientific development. Then, too, may future degenerate times be provided for, and then will be the time for considering whether this be done best by codes or in another form. I do not say that this state of things will ever arrive; this depends upon the combination of the rarest and most fortunate circumstances. What we jurists can contribute towards it, is an openness to conviction, and honest hearty co-operation." The following passage regards the language in which this substance is supposed to be enshrined and communicated: "It has frequently been required that the code should be popular; and Thibaut also once refers to the demand. Properly understood, this demand may be complied with. For language, the most effective medium by which a communication of mind can take place, also checks and limits this mental intercourse in many ways. The best part of thought is frequently absorbed by this medium, in consequence of the incapacity either of the speaker or the hearer. But, by natural ability or art, this medium may be brought under such command, that neither sort of incapacity is any longer an obstacle. The thought passes over the varying characters and capacities of the listeners, and hits them in the common intellectual centre point. Then is it that the high are satisfied, whilst all is clear even to the low; both see the thought above them, in an elevated improving point of view; and it is within the reach of both. Thus, there was somewhere a miraculous image of Christ, which had the property of being a hand's breadth taller than the tallest man who might place himself beside it; were it a man of moderate size, or a little man, that came, the difference was still the same, never greater. This simple, truly popular style, is to be seen (to speak only of our native literature) in our better sort of chronicles, but it may also appear in many other forms. Should we once regain it, many an excellent thing will be possible; amongst others, a good historical style, and, amongst others, a popular code." Savigny plainly states the real grounds of his objections to be, not to a code *qua* code, but to a code made by the present contemporary generation, in consequence of their incompetency. "Thibaut sees the cause of the evil in the sources of the law, and believes that they could remedy it by a code. I, on the other hand, find it in ourselves, and believe, for this very reason, that we are not qualified to frame one." The conditions which he requires for the purposes of composing a good system of law in any shape, are, according to his account, all wanting in Prussia. The first condition is unity of system. "To begin with the least important particular, let any man run over in his mind a number of the jurists now living, and ask himself, whether the existing law could be so much as systematized by their combined labours; he would soon be convinced of the utter impossibility. But that a code is a much greater work, and that a higher degree of organic unity must be required of it, is what no one will deny. In reality, therefore, the code, if it is not to be a mere lifeless, mechanical, and, consequently, worthless composition, could not be framed by such a committee, but only by an individual: the others would only be able to afford a subordinate description of aid, by communicating their advice and opinions on the occurrence of particular doubts, or by exerting themselves to purify the work when completed, by the detection of individual defects. But whoever admits this, must, as regards the present age, despair of the practicability of the proposal; for, to find that same individual the true lawgiver, is perfectly impossible, because, by reason of the heterogeneous character of the modes of thought and knowledge of our jurists, no individual can be treated as the representative of the species." The next condition is, that laws, properly grounded and combined, must consist of leading axioms.

“To distinguish these, and deduce from them the internal connection and the precise degree of affinity which subsist between all juridical notions and rules, is amongst the most difficult of the problems of jurisprudence. Indeed, it is peculiarly this which gives our labours the scientific character. If, then, the code be formed in a time which is unequal to this art, the following evils are inevitable. In the attempt at material completeness, particular decisions, unnoticed by the framers, will be constantly crossing and contradicting each other, which will gradually come to light by practice only, and, in the case of a bad administration of justice, not even by that. This result would be clearly inevitable, so far as contemporaries are concerned, were an age, without being fully qualified, to fix its legal notions by legislative authority in this manner; but the effect of it would be no less injurious to succeeding times.” The last condition provides for the form of laws, and for the art of exposition and of expression, whether it be brevity or diffuseness which the occasion may require. We have extracted and brought into juxtaposition the above passages, with two purposes in view.

The reader will now understand what are the precise qualities upon which Savigny considers the faculty of making good laws of every description to depend; there being no further particularity in the case of codes, but that the difficulty rises with the magnitude of the undertaking. On recapitulating the conditions, the reader must determine how far the English lawyer can comply with them. We cannot but think that the approximation is sufficiently close to encourage us in making the attempt. According to the degree that our conclusion is correct, England need not disclaim the vocation of her age to legislation and jurisprudence. To begin with the last condition, language; Latin was perhaps a better legislative language than even the Greek. French and Italian may have a similar pre-eminence in modern times. Yet there is no reason that we know of for believing that the vagueness of the English statute-book is attributable to the language, and not to the compilers of it. The next condition was a perception of the affinity between different juridical rules and notions. Notwithstanding the extent of the English law, and the consequent dangers hanging over it from day to day, its axioms, and what has been termed the science of legal judgment, have not yet escaped the grasp of the profession. In their talent for analogical reasoning, for seeing the proper legal relation in an individual case, and for an union of theory with practice, the existing English school resembles the Roman, as it existed at the best times of classical jurisprudence. It may be said equally of the great men of both, “Their theory and practice are the same; their theory is framed for immediate application, and their practice is uniformly ennobled by scientific treatment. They see in every principle a case of application, in every case the rule by which it is to be decided; and in the ease with which they pass from generals to particulars, and back again from particulars to generals, their mastery is undeniable.” But the resemblance between the two in the remaining condition is still more striking. “Amongst the Romans in Papinian's time, a code was possible, because their aggregate juridical literature constituted an organic whole. It might be said (to use an expression of the later jurists), that at that time the individual jurists were *fungible* persons. In such a state of things, indeed, there were many ways leading to a good code; one jurist might frame it, and the others afterwards supply particular defects; which was practicable, because each individual jurist was then entitled to rank as the representative of the juridical cultivation of the time; or several, independently of each other, might each work out the whole, and, by collating and combining their productions, a new one might be formed, more complete than each taken singly, but homogeneous with all.” On these grounds, taken from the tests of competency laid down by Savigny himself, we feel justified in submitting to his admirers, that a *prima facie* case at least is made out to this extent, viz. that the common law of England is capable, at the present moment, of being converted into a code.

It may be proper to remind all parties that England, on entering upon this labour, has two great advantages. They are advantages, in the degree to which she enjoys them, certainly peculiar to herself. The first is, the unity of her present system. She has no disturbing forces arising from permanent disparities of soil and of climate between different parts of her empire. She has no personal laws, the inheritance of races that refuse to amalgamate with each other. She has few conflicting customs representing cherished recollections, and wrought into the character of respective portions of her population. The early centralization of her judicial system has prevented all this. She is saved from those embarrassments which the appeal court of Montpelier so forcibly depictured in their criticism on the compromise enforced by the Code Napoleon, between the laws and usages of the *pays du droit écrit* and the *pays du droit coutumier*. These were the obstacles by which James I. was foiled in his darling project of an union between the laws of England and Scotland. He could not succeed, even with the comparatively simple and flexible principles of the criminal laws. What is to be done in a case like that of Canada, where the French and English settlers make it a point of national pride and national antipathy to cling the closer, each to their opposite systems of jurisprudence? Extensive variances of this description, whilst they constitute one of the great necessities for an uniform system of law throughout our Indian empire (if we mean to govern it by Europeans, and to govern it by law), also, on the other hand, constitute a great, though it is to be hoped not insuperable, difficulty in the execution of the task. It is unfortunate that, in this point of view, the practical difficulty of the task must always rise precisely in proportion to the abstract importance that it should be performed. Savigny would estimate very highly the advantage belonging to the unity in our materials; and he would be disposed to do this by the general policy of his historical creed. But all Prussians have been made sensible of it, from the tenderness with which Prussia has been compelled to humour her subjects on this very point. A government which, by breaking up the estates of its landowners, has invaded, and, in the course of a few years, overturned, the rights of private property; which has formed into codes at its pleasure the great body of its Germanized Roman law; and which had actually decreed that all provincial laws should be also turned into codes within three years; was nevertheless defeated here. They were unable to succeed in this last object, excepting in a single province, that of East Prussia; and they have since been compelled to suspend, if not abandon, their purpose in the rest.

The second advantage is scarcely an inferior one. If the remark of Sir James Mackintosh be correct, “that there is but one way of forming a civil code, either consistent with common sense, or that has ever been practised in any country, namely, that of gradually building up the law in proportion as the facts arise which it is to regulate,” too great value cannot be set on the quantity and quality of the judicial materials which the history of a nation may thus have collected in its course. It can be nothing but the intrinsic merit of the English reports which has extorted from Mr Bentham repeated panegyrics. “A library composed of the books in which these cases are thus brought to view,—such a library, even though there were not so much as a single *law* in it, is at any rate a rich storehouse of materials for legislation;

such a storehouse, that without it no tolerably adequate system of laws could be made. The more ample the stock, so that it be not to such a degree vast that the mind is lost in it, the more effectual the provision made for this most necessary and arduous of all intellectual works. The greatest quantity of wealth possessed in this shape by any other nation, is penury in comparison of that which has been furnished by English common law." In the immense mass to which the repertory of its adjudged cases extends, it has well acquitted itself of that preliminary process on which Leibnitz set so high a value. Speaking of the writers of consultations, he has said that they are "almost the only juridical writers who really extend jurisprudence, and enrich it by the observation of new cases." *In his autoribus laudibile est, quod novos emergentes casus perpetuæ memoriæ consignant, orbemque juridicum continuâ auctione locupletant, quod non faciunt autores exercitationum et commentatiorum semper vetera ruminantes.*"

There is an ancient prejudice which has been conceived against the law, both by men of the world and by men of learning. It is high time that the prejudice were removed. This would be done as soon as ever means were taken to do justice to the good sense, the close reasoning, and just principles, at present buried under its forms. The science, however, must be reconstructed by authority, before the points and peculiarities of the law can, by a proper analysis and synthesis, be so separated and combined as to clear away unsatisfactory anomalies, and present its rules in a way which will bear examination. When Lord Mansfield boasted that the English law was a law of principle, he at least saw the means of making it so. He had made it so for himself. When Hale called upon every student to methodize the law in his reading, telling him, that otherwise he could never carry it in his memory for seven years together, or a much shorter period, he could not have stopped by choice at the case of individual students. He must have been prepared to call upon the legislature to take the same course, for the sake of the profession who were to practise it, and the public who were to obey it. The advantage of whatever method or principle can be put into the law is one of those advantages which ought to be diffused as widely, and put forward as prominently, as possible. These two things are so nearly connected, that we must not expect to get the benefit of one without the other. By the help of method, the true principles are brought to light; and then, by a philosophical re-action, the principles do as much in return, or more, towards assisting us to improve our methods. The perfection of both terminates in a code. With this view, Bacon's collection of legal maxims appears to have been one of his most valuable works, though only a small portion of them has been preserved. He speaks of them as the *regulæ juris,* with their differences and limitations, warranted by good authorities, and set forth by discourse and deducement in a just tractate, "the thing most important to the health and good institution of laws." He had seen little in this kind either in our law or in that of others which satisfied him, but he was so well satisfied with the beginning which he had made himself, that he had the confidence to assure his majesty, "I am in good hope, that when Sir Edward Coke's reports, and my own rules and decisions, shall come to posterity, there will be (whatsoever is now thought) question who was the greater lawyer." It will be seen, when the English law is thus put into system, whether it can, equally with the Roman, deserve the commendation which Leibnitz bestowed upon the Roman, when he said of it, that he knew nothing so mathematical out of the mathematics.

The practical question upon which the estimate of a code, or, in other words, of enacted law, must depend, involves three distinct points. First, what are the evils inherent in unenacted law generally? next, what are those which are peculiar to the particular shape which unenacted law has assumed in England? These are matters of fact. There is a further question, how far the turning of unenacted into enacted law is likely to get rid of these evils. This must be comparatively a matter of opinion. These points have been anticipated more or less in our historical narrative. The inquirer is referred for a more particular detail to Mr Bentham's papers on Codification, and to the comment on them by Sir Samuel Romilly in the fifty-seventh number of the *Edinburgh Review.* He will find there what is the nature of the unknown God from whose worship it is one of the principal objects of a code to set him free. These evils are reduced in malignity under the English system, and, to a considerable degree, are kept out of public sight, from the manner in which common law and statute law are there mixed up together. Otherwise a system of barefaced judge-made law, and nothing else, would not be tolerated for a day. It is true that laws, however constituted, cannot sustain the character of a people, when, from more powerful independent causes, the national character is falling into decay. It is true also that such a people will pull down their laws with them. Still it is a presumption against the possible stability and firmness of unenacted law, that all the admitted excellence of the expositions of the Roman jurisconsults of the third century could not prevent the civil law from getting into such a state of anarchy, that a code, put together by very inferior workmen, was acknowledged, universally, of two evils to have become the least.

There is a proverbial saying, by which law is denominated a necessary evil. The expression assumes, and assumes truly, that there are evils inseparable from law. Amongst these, are particular consequences, which it has been sometimes absurdly expected, or disingenuously represented, that codification would remove. We must mention a few of those which wise reformers never held, and which ignorant ones must instantly give up. The first of these fallacies, and almost the most absurd, is the imagination of such a thing as an immutable code. There is no such combination as "man and for ever." We must leave to pretenders, playing at legislation, like Frederick the Great or the Empress Catherine, the fiction that a code may be a manual as cheap, short, and familiar, as a catechism; and that its immediate consequence will be the enabling the world to dispense with lawyers as a distinct profession. Instead of doing away with judges and lawyers, professionally educated, the effect of a good system must be quite the reverse. It is among the merits of a code properly made and properly studied, that it will want lawyers of a higher order, and that it will help to make them. The notion of doing without the profession of the law belongs to the region of the legal debates during the Commonwealth, in one of which it was seriously moved to burn the records. The unlearned member was of course proceeding upon Knox's principle in ecclesiastical reform, viz. to displace the rooks by pulling down the rookeries. Hale had some trouble to bring the fanatics to reason. If the notion of simplifying the interpretation of a code by destroying the old authorities be absurd on one hand, equally so is the opposite notion, that the neglect of them will be the necessary consequence of a code. It is nothing to the discredit of the reforms by Justinian (quite the contrary) to admit that, in case he had been succeeded by enlightened times, the *Jurisprudentia ante-Justinianea* would not have been suffered to fall into oblivion. Is the question a different one with regard to the contributions of contemporary legal learning? Not at all. Yet the government of Bavaria was insane enough, in publishing its new penal code in 1813, to follow it up by an ordinance that no public servant or lawyer should print a commentary upon it. It was the plain consequence of such an order, as far as government was concerned, to abolish law as a science, to deprive it of all capability of improvement, and to perpetuate every existing blunder. The most appropriate and righteous censure which could be passed upon such folly, was the necessity which they had to submit to, of stultifying themselves by being obliged to add to this perfect work above one hundred *novels* within the four succeeding years. An attempt to repress what the French call the *Jurisprudence des Arrêts*, by discouraging the preservation and the study of judicial decisions, under the alarm of being overwhelmed by them, is even still more prejudicial. For this is to dry up at its source the natural fountain, whose tributary waters, if duly analysed and conducted, are, from among many subsidiary means, the best qualified of all for supplying the code from time to time with whatever accessions it may require, and for maintaining it on a proper level with the wants and the intelligence of society. It shows the incorrigibleness of mankind, that most of these modern errors are only repetitions of the very errors which were committed by Tribonian.

The sooner all delusive hopes are laid aside the better. We are spared disappointment in quarters where nothing but disappointment is to be met with; and by concentrating our efforts in the right direction, upon objects within our reach, all that is attainable is more likely to be attained. How far is it possible to reduce the causes of litigation by giving to the law what Bentham has chosen to term *cognoscibility?* Every possible facility to litigation, wherever rights given to a party by the law are violated or withheld, is one of the most obvious, though one of the most neglected, duties of society. On the other hand, that it is extremely desirable, and also to a certain extent practicable, to reduce the causes of litigation, which arise from the uncertainty of the law, nobody can deny. But, on comparing their respective amounts of litigation, with the view of testing thereby the merit of their respective legal systems, there are unavoidable difficulties in the way of a fair comparison between one country and another. Tabular returns from courts of justice, in the case of countries governed respectively by enacted and unenacted law, have, as was said above, never been inquired into with this object. But the tables are yet to be drawn up, which a person who knew what he ought to look for would be at the trouble of consulting. Tables, to be of any use for this purpose, must distinguish, by appropriate classification, the falling off in litigation, which is to be set down to the clearness with which a government has simplified or particularized its laws, from the falling off which as certainly would take place as often as a government had succeeded, by the help of complication, expense, or terror, in obstructing the entrance into its tribunals. Consequently we should not place much value (were they to be had) on numbers given in the gross, one way or the other. But there are facts in evidence which, whatever else may be their value, are fully sufficient to refute the assertion that codes must necessarily increase litigation. Filangieri, for example (t. v. p. 370), quotes from *Formey's abridged Exposition of the Royal Plan for the Reform of Justice*, the example of Pomerania. In consequence of its having been proverbially called *terra litigiosa*, it was the first selected by Frederick the Great for his experiment. The result was, that law-suits became rarer every day. After such an event as the French revolution, how many causes, besides the legal novelty of the code, might explain a sudden rush into courts of justice. Meyer observes, that, in the Low Countries, and in Rhenish Prussia, authentic interpretations of the Code Napoleon, during the short time that those countries had been subjected to its jurisdiction, had so satisfactorily verified the greater part of its debateable points, that this class of litigation was already sensibly on the decline. We have no reason to believe that it is not the same in France. Again, although it is essential to improvement in the law that juridical learning should be cultivated, and adjudged cases collected and studied, yet it is as essential to one of the main advantages expected from a code, that its auxiliary literature should not supersede, and, as it were, swamp the precise letter of the enacted law. The character of *cognoscibility* would otherwise again be lost. The opponents of codes have strenuously maintained that juridical learning comes of so progressive and masterful a stock, that a code cannot possibly escape from the alternative of all or none. The proposed dilemma leaves us to choose which of the evils we shall prefer. Whichever we may choose, we are asked in a sarcastic tone to calculate the mighty stakes which we have won, and to answer honestly, whether we find them worth the trouble which we have had in playing for them. On this point also the example of France is shaken *in terrorem* over England and America. All who would lay irreverent hands upon the ark of the common law, are solemnly and perseveringly assured that the drowning of the Code Napoleon in a sea of literature and jurisprudence, is already the most characteristic and undoubted fact in the legal history of France. This, by the way, were it correct, would be an ample answer to the narrowness and poverty of their legal learning, which Savigny conceived must be the consequence of the adoption of a code in the actual circumstances of that country. There can be no question that such a state of things as that described, supposing the representation accurate, would be a good *argumentum ad hominem* to any Frenchman who were to boast that *the Code Napoleon had solved the problem.* But it would prove nothing against codification in general; unless codifiers were to admit that the Code Napoleon, and the circumstances under which it had been introduced and administered, were all as good as possible. What, however, are the facts? In 1822, M. Dupin wrote his *Essay de la Jurisprudence des Arrêts*, with the view principally of remonstrating against the excess to which French advocates were carrying, especially in the provinces, the citation of judicial precedents in their arguments. He mentions as a flagrant abuse (whatever English practitioners may think of it), an instance where an advocate had cited fourteen cases. The practice, he adds, sometimes passed from the bar even to the bench. This was thought to look ominous. Fortunately we have the positive testimony of M. Dupin himself, that, notwithstanding an occasional dip or so, the code keeps its head triumphantly above the waters, and easily shakes off these encumbrances. In 1826, Mr Sampson had been so perplexed by what he was constantly hearing of the warning to codifiers, contained in the present state of French jurisprudence, that he took courage and addressed M. Dupin personally. "We are told," he says, "that the French codes have had but the life of a day; that the civil code, the model of all the others, is already almost buried by the multiplicity of laws, decrees, and commentaries with which it is loaded; and that, in a short time, the law will be sought for, not in the code, but in the solutions of its difficulties, and in the questions to which it has given rise. What degree of credit is due to the assertion?" It was impossible to consult an oracle more above all suspicion than the lawyer who, four years before, was on the alert, and had appeared to be himself sounding the alarm. But nothing can be more satisfactory than M. Dupin's answer on the question put to him. On the other hand, he properly recognizes and claims, in aid of a code, the full benefit of the just distinction between the learning of the jurist and the authority of the law. "The assertion," he answers, "is not true, that the jurisprudence of decided cases has prevailed in any way against the text of our codes; nor are we in any way threatened, even at a distance, with the danger of seeing the letter of our laws disappear under the load of interpretations. In every discussion, the text of the law is first looked into, and if the law has spoken, *non exemplis sed legibus judicandum est.* If the law has not clearly decided the point in question, its silence or its error is endeavoured to be supplied. But what country is there where decisions have not thus been used to supply the defects of legislation?" That this is, therefore, the fact in France, we must take M. Dupin's word; and we can have no difficulty in taking it. But the last paragraph admits that in France judge-made law is creeping in beyond what Meyer states it to have done in the Low Countries. And, though M. Dupin is protected against the error of putting the two sources of law, the legislative and the judicial, in opposition to each other, it is equally certain that inferior lawyers are equally secure. He had observed, in his *Jurisprudence des Arrêts*, that nothing was more common than to hear the two things put in contradiction, law and jurisprudence. *Il est de principe en droit que—mais la jurisprudence est contraire; c'est-à-dire, les arrêts ont jugé autrement.* After such a statement, he must not be surprised that strangers have been misled by his book, or that hostile readers of his letter should only use it in order to quote him against himself. Taking the letter by itself, all that is wanted in French legislative organization is an institution charged with the duty of condensing and carrying up the rectified spirit of their judicial decisions from the courts to the legislature. The legislature ought to permit no department in the state to exercise legislative power except itself; and it ought to be provided with the official means of duly discharging its trust. The province of the court of cassation, as a central and regulating power, is of infinite use. Its decisions are reported officially, but its province stops short of the still higher jurisdiction of the institution which is required for the present purpose. The necessity of a "council of laws" of this description has been frequently established by writers on the theory of legislation. It was mentioned during the discussions on the Code Napoleon, but unfortunately dropped through. Without it, any system of enacted law, however complete and correct, at a given moment, cannot long continue so. Jurisprudence must get ahead of law. Upon these points, therefore, how does the argument stand? Whatever may be the form in which laws subsist (code or no code), on either supposition fresh cases will be rising up, which are fairly determinable under the existing law, but only determinable by means of judicial interpretation. The question is, which of the systems offers the likelihood of the fewest of these instances occurring, and, when they do occur, that a ready and a rational interpretation will be at hand? Again, on either supposition, fresh cases must also be rising up, which, not falling within the existing law, must be provided for, directly or indirectly, by further legislation. There are many reasons, in our opinion, why, upon both occasions, viz. that of a demand for fresh interpretation and for fresh legislation, the work would be better done under a system of enacted than of unenacted law. For the converse conclusion we are aware of no reason whatsoever.

On the supposition that a code is decided upon, there remain behind very important considerations, which have been incidentally alluded to in former parts of the present paper, but which the space that we have already occupied will not allow of our formally discussing. 1. Every species of preliminary aid ought to be forthcoming. By what inquiries, arrangements, and writings, shall we best prepare the way for the formation of a complete and correct code, and facilitate its practical introduction? 2. The best machinery for executing the work ought to be procured. Is it likely to be most effectually performed by a single presiding mind, as Mr Bentham proposes? or by a commission more or less numerous? In the latter case, the principle on which the labour is distributed amongst the persons employed will have to be well considered. At this stage, too, the main question of all comes to be determined; that is, upon what principle the code is to be drawn up. Are the common law and the statute law to be kept distinct, or to be incorporated with each other? In either case, is the form to be that of articulate propositions, or of a miscellaneous digest? If a digest, is it to be arranged by title and method, or by historically following the course of time? 3. A code will want protecting against encroachment, from the moment that it is passed. Accordingly, the collateral regulations which may help to secure it by a vigilant control over the judiciary, must be carefully reviewed. For this end, questions of the following kind should be anticipated and fixed. Ought judges to be required in every judgment to specify the authority in the code on which their judgment is founded? Ought judges in pronouncing judgment, or advocates in conducting a forensic argument, to be restrained to a particular class of authorities? Concurrently with the formation of a code, a tribunal distinct from and raised above the ordinary courts (something like the court of cassation) may be wanted, in order to keep the ordinary administration of justice within the sphere to which it is one of the definite objects of a code that judicial interpretation should be confined. 4. Lastly, the code will want improving. This must be provided for by prospective regulations; by the creation of a minister of justice, or a council of laws, expressly appointed to superintend the unity and the efficiency of the entire system, and specially instructed to keep open an active communication between the tribunals and the legislature. Cases, either not provided for at all, or provided for imperfectly, will from time to time be brought unsuccessfully before the courts. The occurrence of such cases will direct the attention of the officers in question to a point upon which, it is evident, by the supposition, that new legislation is wanted for the purposes of justice. In other cases, which nevertheless have been successfully carried through the courts to final judgment, the interpretation of the courts will have wandered wider than is expedient from the strict letter of the law. The occurrence of this latter class of cases will point out the necessity of enlarging the provisions of the code into a more explicit conformity with the judicial construction put upon them. Theoretical writers, in contemplating the possibility of drawing nearer and nearer towards a perfect system, have perceived, that an institution of this kind is an indispensable condition. We repeat the observation here, from our sense of its importance. This is the object of the permanent commission recommended by Lord Bacon. And a council of laws for the absorption and assimilation of occasional jurisprudence into the general body of the law, is part of the political mechanism suggested in the "idea of a perfect commonwealth."

We cannot dismiss this subject without referring the reader to the concluding observations of the *Second Report of the Commissioners appointed to inquire into the Consolidation of the Statute Law* (page 29). The Report bears date July 1835. The suggestions are the deliberate recommendations of practical lawyers, acting under the authority of parliament. On remarking how nearly they approach to the recommendation of a code (for the whole principle of a code is contained in the suggestions), the thinking part of the public may well feel satisfied with the quiet progress which the question is making from year to year. The time is evidently approaching, perhaps more rapidly than we are aware, when "a work rare enough in the memory of times to show it excellent, and yet not so rare as to make it suspected for impossible, inconvenient, or unsafe," must be undertaken by us. Glory and gratitude to the men who shall be privileged in that day to stand in the presence of their fellow-citizens, having so raised their minds, and shaped their studies, as to be worthy of the "vocation" to which our age and country are assuredly called.

(E. E. E. E.)

LEGISLATOR, a lawgiver, or person who establishes the polity and laws of a state. Such was Moses amongst the Jews, Lycurgus among the Lacedemonians, and many others.

LEGITIMATION, an act by which illegitimate children are rendered legitimate.

LEGNAGO, a city of Italy, in the Austrian delegation of Verona. It is the capital of a district, and is strongly fortified. It is situated on the river Etsch or Adige, between which and the Tartaro is a marshy plain, on which a great extent of land produces excellent crops of rice. It is a well-built city, containing several churches and a fine theatre, and inhabited by 5920 persons. Long. 11. 13. 48. E. Lat. 45. 11. 18. N.

LEGUMEN, a species of seed-vessel which has two valves or external openings, enclosing a number of seeds which are fastened along one suture only. In this last circumstance the seed-vessel in question differs from that termed by botanists *siliqua*, in which the enclosed seeds are fastened alternately to both the sutures or joinings of the pod.

LEGUMINOUS, an appellation given to all plants the fruit of which is a legumen.

LEIBNITZ, GODFREY WILLIAM, BARON DE, a philosopher and mathematician of the first order, and the most universal scholar of modern times, was born at Leipsig on the third of July 1646. At the age of six he lost his father, Frederick Leibnitz, professor of law, and secretary to the university. After this event his mother placed him in the school of St Nicolas at Leipsig. Here he learned the principles of the Greek and Latin languages; but soon breaking through a routine ill suited to his precocious disposition, he applied himself to the study of the classic writers of both languages. Titus Livius and Virgil became his favourite authors; and in his old age he could still repeat entire cantos of the Roman poet. Early distinguished by a rare facility in performing his tasks, he often assisted such of his companions as dulness or idleness prevented from completing their own; and he himself informs us, that when scarcely fourteen, he composed in this way three hundred Latin verses in one day, without any elisions; but he takes care to add, "Credo a lectore non quæri quam cito, sed quam bene." At fifteen he entered on his academical career in the university of Leipsig, and, under the direction of Thomasius, devoted himself to the study of philosophy and the mathematics. He then passed a year at Iena, and returned to Leipsig, where he occupied himself with law and philosophy. Having soon mastered the details of the philosophical and mathematical sciences, the genius of Leibnitz now took a grander flight, directing him to the writings of Plato and of Aristotle. These he not only read and thoroughly comprehended, but used to pass entire days in a wood near Leipsig, endeavouring to reconcile the doctrines of the Academy with those of the Lyceum. He was scarcely twenty when he wished to be received as doctor of laws; but although some petty jealousies prevented his want of the requisite standing or age being dispensed with at Leipsig, this favour was granted him without difficulty by the university of Altorf, which at the same time offered him the situation of extraordinary professor of law. This, however, he declined; and leaving Altorf, he proceeded to Nuremberg, where a considerable number of men of science and learning were then assembled. At that time a society of chemists in that city occupied themselves with researches, the object of which was to discover the philosopher's stone. Tormented with a continual desire of acquiring something new, Leibnitz hoped to find, even in the reveries of these visionaries, some aliment for his mind. With this view he wrote to the society soliciting admission, and craving to be initiated into their mysteries. This letter, which was full of abstruse terms extracted from books of chemistry, and so conformable to the style of these mystics that he himself did not understand it, had prodigious success. Leibnitz was admitted a member of the society, and immediately appointed secretary thereto. His duty in this capacity consisted in registering their processes and experiments, and in extracting from the books of the chemists such things as might be of use to his associates in prosecuting their researches.

But happily for himself and the sciences, Leibnitz, whilst at Nuremberg, chanced to make the acquaintance of the Baron de Boineburg, chancellor to the elector of Mayence, who, being struck with his merit, and conceiving a high opinion of his talents and learning, recommended to him to apply himself particularly to history and jurisprudence, and expressed a desire to see him established at Frankfort, at the same time promising to obtain him some employment under his sovereign. Leibnitz followed the judicious counsel thus given him; and from this epoch, 1667, may be dated the real commencement of his literary career. It was at Frankfort that he brought out his *Nova Methodus discendæ docendæque Jurisprudentiam.* This little volume contained a *tableau raisonné* of the objects necessary for the double purpose expressed in the title; and in it he already displayed that practical spirit which enabled him to produce so much that is really useful. But that which placed its author in the first rank of philosophical writers, was the new manner in which he treated his subject, and the profound and ingenious views which he presented in regard to a science so long abandoned to routine and pedantry. The order, the clearness, the precision of the ideas, and the style which makes books live, contributed to give great popularity to this production, which, at a subsequent period, the author himself judged with impartiality.[1] We may also mention here a treatise published in 1669 in favour of the Prince of Neuburg, whom Leibnitz endeavoured to recommend to the Poles, as uniting, in a higher degree than all his competitors, the qualities they required in their king. This piece, which is somewhat lengthy, is written in Latin, and consists of sixty propositions, proved by a rigorous series of axioms, supported sometimes by expositions full of erudition, amongst which may be mentioned that under the head, *Eligendus Catholicus esto.* These propositions do not always follow in a necessary order; some of them are superfluous; and the form is a little fatiguing, especially since the interest of the subject has altogether ceased. The Prince of Neuburg was not elected king. But the work of Leibnitz did not on that account make a less sensation, and may, in fact, be regarded as a sort of *tour de force.* Boineburg, at whose request it had been composed, observing with satisfaction that Leibnitz justified the idea which he had conceived of his talents, attached him to the service of the elector, by causing him to be appointed counsellor of the chamber of revision in the chancery of the electorate of Mayence.

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[1] Leibnitii *Opera Omnia*, tom. iv. p. 4. Geneva, Dutens, 1768.

The material occupations of this office, however, could not shackle a genius so vast and so active as that of Leibnitz. He held it during three years; and it was in this interval that he conceived the design of re-casting or new-modelling the Encyclopædia of Alstedius. It is not well known what his ideas then were respecting this project; but in some subsequent writings he explains himself in a manner sufficiently specific. He defines the Encyclopædia to be the "system of all the true and useful propositions then known." He thinks that, to be complete, it should contain definitions of all words; explanations of every fundamental and useful process in the liberal and mechanic arts; and, lastly, a summary of universal history. He then enumerates the different branches of human knowledge; indicates, as models to be followed in each, the principal existing works, amongst which he cites some of his own, and points out what remains to be done; and, finally, he recommends the order of the materials or subjects, in preference to the order of the alphabet.[1] In another passage he recommends subjoining to the treatise on each science a succinct account of its origin and progress, together with a list of the authors who have treated of it in detail. This was one of the predominant ideas of his life, one to which he appeared to attach great importance, and which occupied his mind as long as he lived.

Leibnitz now began to evince a mastery in almost all the sciences. He already enjoyed a great reputation as jurisconsult and philosopher; and he made himself known in physics by the publication of two treatises, viz. *Theoria Motus abstracti* and *Theoria Motus concreti*, which appeared in 1671. These theories were not admitted by philosophers, and did not deserve to be so; but they nevertheless excited astonishment by the boldness and originality of genius displayed in the conception of them. The year following he brought out, at the request of Boineburg, a small treatise entitled *Sacrosancta Trinitas per nova argumenta logica defensa.* In this work, intended to refute the attacks of a Pole named Wissowatius against the doctrine of the Trinity, the author endeavours to show that sound logic is not contrary to orthodoxy. Thus each year Leibnitz produced some work, which served as a new title of distinction, and enabled him to rank successively amongst the masters in the different sciences.

He had long entertained a desire to visit Paris. France then fixed the attention of the learned world, and extorted the admiration of Europe by the victories and the influence of the great monarch to whom she also owed an extraordinary development of military and literary glory. Leibnitz felt the importance of forming a connection with the learned men of that country; and Boineburg procured him the means of attaining this object, by proposing to him to accompany his son, whom he was then sending to Paris. Delighted with the proposal, and at the same time anxious to testify his gratitude to so zealous a patron, Leibnitz gladly accepted the offer, and set out for Paris in 1672. Placed amongst the illustrious men of that capital, and already worthy of them, he felt that ardour which leads to the distinction conferred by useful discoveries burn with redoubled force in his bosom. He now applied himself more especially to the mathematics, in which he had not as yet made any considerable progress; and this choice, in the midst of distractions of every kind in a new society, and of studies apparently much more attractive, is not one of the least proofs of the force and energy of his character. He found at Paris the illustrious Huygens; and he afterwards confessed, with that ingenuousness which is so becoming in great men, his obligations to the work *De Horologio Oscillatorio*, which had just appeared, and which, of all modern works, after those of Galileo and Descartes, proved the most useful to Leibnitz. The learned men whose society he frequented soon recognized his superior genius; and he confirmed this high estimate of his powers by the exposition of his ideas on the reform of the arithmetical machine of Pascal, or rather by the invention of a new machine, which he has described in the *Miscellanea Berolinensia*.[2] He obtained the suffrages of the Academy of Sciences, the members of which signified to him that he might be admitted into that illustrious body as pensionary, provided he chose to embrace the Catholic religion; but although the proposition was equally honourable to Leibnitz, as a proof of the estimation in which his talents were held, and to the Academy, which knew how to appreciate them, he did not think it proper or right for him to accept the offer.

His protector Boineburg died in 1673; and having no longer any business to detain him at Paris, he passed over into England, where he was received with the same distinction as in France. He had the satisfaction of making the acquaintance and enjoying the society of Boyle, Oldenburg, Collins, and other celebrated men, who disputed the palm in several of the sciences with the philosophers of the Continent; and it was from Collins that he received some hints concerning the invention of the method of fluxions, which had been discovered by Newton as early as the year 1664 or 1665, and by him communicated to Dr Barrow in 1669. But he had not been long in England when he received intelligence of the death of the elector of Mayence, by which he lost his pension. As this event made an entire change in his position, he resolved to communicate his embarrassments to the Duke of Brunswick-Lunenburg. This prince, who had always testified much regard for him, availed himself of the opportunity thus afforded him to assure Leibnitz of his favour, and to offer him the situation of counsellor, with a salary, at the same time granting him permission to prolong at pleasure his stay abroad. Overjoyed with this reply, which removed all cause of uneasiness as to his circumstances, Leibnitz returned to Paris, where he remained fifteen months buried in the depths of geometry. He quitted Paris in 1674, revisited England where he spent fifteen days, and proceeded by way of Holland to join his new benefactor. Leibnitz was still under thirty. At an age when great men are in general only beginning to distinguish themselves, each in his respective career, he had entered upon almost all in succession; had received, in the three countries which he had visited, testimonies of the highest esteem; and had established, with a great number of learned men, literary connections, which proved very advantageous to the sciences. We shall soon see him attain a still more commanding eminence, and at length arrive at that species of supremacy which he acquired over his age by the universality of his genius and talents.

Soon after his arrival at Hanover, he published his treatise on the Right of Sovereignty and of Embassy claimed by the Princes of Germany, who demanded the same privilege as the electors, namely, those enjoyed by kings. This work, which appeared under the name of *Cæsarinus Furstnerius*, and maintains that the emperor is the temporal head of the states of the West, as the pope is the spiritual head, possesses little interest at the present day; but it displays a profound knowledge of public law and of history, gives minute details of titles and ceremonial, and is written in that decorous and measured style which distinguishes all the writings of Leibnitz. He continued to cultivate all the sciences. He likewise supported, by every means in his power, the project of publishing the *Acta Eruditorum*, the first volume of which appeared at Leipsig in the year 1682. The celebrity which this journal acquired from its very commencement was in a great measure owing to Leibnitz, who enriched it with a great variety of curious pieces, from extracts of rare books, to problems in the higher geometry.

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[1] See *Opera Omnia*, tom. v. pp. 181–185; also tom. v. p. 405.

[2] See *Miscell. Berolin.* i. xxxi. and fig. 73. In 1763 he had exhibited this machine to the Royal Society of London; and, in fact, it appears to have occupied his attention at intervals during the whole of his life. It is still preserved in the Museum of Göttingen, and is thought superior to other machines of the same kind. (Gersten, xvii. 232.)

The Duke of Brunswick died in 1679; but his successor, Ernest Augustus, afterwards George I. of England, inheriting the same esteem for Leibnitz, extended to him the same favour, and engaged him to write the history of the house of Brunswick. Leibnitz, anxious to obey this honourable call, resolved to visit the south of Germany and Italy, that in these countries he might make the necessary researches, and collect materials for the work. He devoted no less than three years to these journeys, consulting learned men, exploring libraries and archives, perusing old charters and manuscripts, and examining other monuments.[1] The fruit of so many researches was a prodigious collection of materials of all kinds. Besides the documents necessary for his history, it comprehended an immense multitude of political and diplomatic acts, as declarations of war, manifestoes, contracts of marriage, treaties of peace, bulls, and other public pieces. Leibnitz put these materials in order, and with their aid produced a work altogether different from, and independent of, the principal, and indeed one of much greater importance, entitled *Codex Juris Gentium Diplomaticus*, the first volume of which appeared in 1693, and the second in 1700, under the title of *Mantissa Codicis*. This collection contains a great number of acts which had never before appeared, and many others which, though previously published, had become very scarce. Read with discernment, it exhibits great knowledge, not only of history, but also of the genius of nations and languages, as well as of other subjects of inferior interest and importance. In other respects, any methodical mind might have been capable of a similar effort. What the genius of Leibnitz could alone produce is the preface to the work, in which, ascending to the principles of natural law and the law of nations, he expounds his ideas on both with great depth and originality. But that which distinguishes this book, and the preceding ones published by him on the same subjects, particularly his project for compiling a new body of law,[2] from those of the same epoch, is the tendency towards that reasonable reform of jurisprudence which was afterwards effected, in a great measure owing to the influence of Leibnitz, by whom its necessity was first pointed out; and likewise the union, recommended throughout, of the study of jurisprudence with that of religion and philosophy, which he regarded as the most solid basis of human happiness.[3]

In the midst of labours so various, he did not lose sight of the principal object of his recent travels, and occupied himself diligently in collecting the historians of Brunswick. He even composed for that house several writings, one of which, intended to establish its connection with the house of Este, procured for him the place of privy councillor of justice; a sinecure appointment destined to recompense his zeal without withdrawing him from his ordinary labours, amongst which the history, with its collateral branches, occupied an important place. The immense researches Leibnitz had made for the history of Brunswick, however, furnished him with materials for other works of a secondary kind. Thus in 1698 he published a new collection under the title of *Accessiones Historicæ* (in two vols. 4to), containing a great number of rare and curious pieces, which had escaped the observation of his predecessors. But nothing attests so much the extent of his views as what he did for the history he had undertaken. He commenced by collecting all the writers who had spoken of the house of Brunswick. The first volume appeared in 1707, the second in 1710, and the third in 1711; and subjoined were extracts from all the ancient authors relative to the tribes inhabiting the banks of the Elbe and the Weser, with notes explanatory of obscure passages. This collection, therefore, like those of Muratori, Duchesne, and others, had a merit independent of the object for which it had been compiled. But it was still, so to speak, only a preliminary work. The history even of Brunswick has not appeared. The learned Eckhard found amongst the papers of Leibnitz only the plan of it, which he published in the *Acta Eruditorum* of 1717. This history was to have been preceded by a dissertation on the primitive state of the globe, and particularly of Germany. A curious monument of the ideas of Leibnitz on this subject is contained in his *Protogæa*, a sort of essay, which, in 1693, he caused to be inserted in the Leipsig journal, and which was afterwards published separately by Scheidius (Göttingen, 1749, in 4to). In this production he attempts to explain the formation of the earth, and of the different substances which it includes. He admits a conflagration of the globe, then a general submersion, which, independently of the testimony of Scripture, is sufficiently established by the animal and vegetable remains that are frequently met with, and at different heights. This double hypothesis enables him to assign to the solid bodies (*corpora firma*) a double origin, that is, cooling after the fusion, and consolidation after the subsiding and evaporation of the waters; and in these ideas he finds the germ of a new science, which he calls *Natural Geography*. He enters into some details on minerals, and speaks of crystals, which he considers as the geometry of inanimate nature. Further, Leibnitz thought it incumbent on him to prove that animal and vegetable petrifactions were not a freak or sport of nature (*jeu de la nature*), and also to rebut forcibly the opinion as to the productive power of matter. This short exposition will suffice to give an idea of the immensity of the plan of Leibnitz, and of the prodigious variety of subjects which it embraces; a plan in many respects similar to that which has been followed by Herder and some other authors posterior to Leibnitz. It is much to be regretted that this design was not carried into execution, seeing it would probably have presented a solution of many historical and other problems of the greatest importance.

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[1] It was in one of these expeditions that, finding himself overtaken by a tempest in the Adriatic Sea, whilst passing from Venice to Mesola, he heard the pilot of the bark, who did not imagine he was understood by the stranger, propose to the crew to throw into the sea the German heretic, whose presence on board was, he conceived, the sole cause of the squall (*bourasque*). Leibnitz, without appearing to have heard anything, or betraying the slightest emotion, drew from his pocket a chaplet or rosary, and commenced telling the beads with great seeming devotion. This quiet artifice saved him; one of the crew observing to the pilot, that as the man was not a heretic, it would be of no use to throw him into the sea.

[2] *Corporis Juris Reconcinnandi Ratio*, Mayence, 1668, in 12mo.

[3] *Opera Omnia*, tom. vi. p. 4, *et passim*.

We must here take particular notice of one of those works which he continually let drop from his hands, and which were, so to speak, merely his pastimes; we mean his book on the origin of the Franks.[1] This people, he conceives, came originally from the shores of the Baltic Sea. He founds his opinion on the authority of the anonymous writer of Ravenna, and of Ermoldus Nigellus, a French poet of the ninth century, and on passages in several authors; alleging, moreover, that some of the ancients have confounded the Palus Mæotis with the Baltic Sea. This opinion was attacked by Father Tournemine, who combated it with much urbanity, saying, amongst other things, that, even in espousing a contrary hypothesis, the French did not disclaim being the countrymen of Leibnitz, since he appeared to have proved that the Franks had occupied the countries situated between the right bank of the Rhine and the Ocean. Gundling also published a refutation of the assertions of Leibnitz. The latter, who did not hold himself beaten, replied to both his antagonists; but, far from pretending to decide in the last resort, he appealed to the judgment of several learned men of his time, and, amongst others, to that of Huet and Montfaucon, whom he highly respected on account of their learning.

This seems the proper place to speak of the correspondence which Leibnitz for a long time maintained with Bossuet, in regard to the project for the re-union of the Protestants with the Catholics; a project which had for some time been pushed with activity, and which gave Leibnitz occasion to display attainments in theology which no one could ever have suspected in a mathematician of the first order. The details may be seen in the History of Bossuet by M. Bausset.[2] It is sufficient to state that this negociation, in which Leibnitz did not take part till the year 1692, was carried on with a degree of good faith very rare indeed in affairs of this description; that at one time it encouraged the hope of a successful and happy termination; and that it ultimately failed, owing to circumstances altogether independent of the matters which had formed the subjects of discussion. Amongst these may be reckoned the new political situation in which the elector of Hanover, to whom Leibnitz was altogether devoted, found himself placed in the year 1701. This prince saw reason to apprehend, that were he to labour longer in endeavouring to effect a reconciliation between the two communions, he might alienate the English people, who then manifested the greatest aversion to Catholicism, and might even bar his accession to the throne of England, to which he saw himself eventually called. From the *Syntagma Theologicum* of Leibnitz, however, it is clear that this philosopher had personally little disinclination to the doctrines of the Catholic church. To effect the re-union desired, he had reckoned much upon the influence of Louis XIV.; and it is curious to observe how this prince is judged by a man as independent of France as Leibnitz then was.[3]

Having been admitted a member of the Royal Society of London during his second visit to England in 1674, and associated to the Academy of Sciences at Paris since 1699, Leibnitz too well appreciated the advantages which academies owe to this combination of labours directed towards a common centre, not to second, by all the means in his power, the project for establishing a Royal Academy at Berlin, formed in 1700 by the elector of Brandenburg, who, the following year, assumed the title of king of Prussia. This prince had solicited the advice and assistance of Leibnitz. The reply of the latter is equally remarkable for the excellence and wisdom of its views, and the great simplicity by which it is throughout distinguished. "The object," says he, "ought to be to advance the happiness of men, which consists principally in wisdom and in virtue, and next in health and the comforts of life." He points out, as the first object, "the good education of youth, which includes also the regulation of studies; nothing being more important than to give a good cast to the mind as well as to the body." He then indicates summarily the plan of study which the Academy ought to recommend, and which is in the main that presently followed in the universities of Germany. The elector, as may well be supposed, adopted the views of Leibnitz. But he did more; he appointed him president of the new society, with the most unlimited powers, and without any restraint as to residence, or requiring that he should quit the service of the elector of Brunswick. The patent by which this office was conferred forms one of the most honourable titles ever bestowed on a man of learning and science.

Eleven years later, Leibnitz received marked proofs of confidence on the part of Peter I. of Russia, who, during his travels in Saxony, consulted him as to the execution of his vast projects relative to the civilization of his empire, and to whom Leibnitz in his turn communicated views with which that monarch expressed himself highly satisfied. In reward of this service he received the title of privy councillor. Lastly, the king of Prussia having died in 1713, Leibnitz, who foresaw the fall of the Academy of Berlin under his successor, repaired to Vienna to propose to the Emperor Charles VI. the institution of a similar body, wherein the sciences, which were about to be banished from Berlin, might find an asylum. Owing to several circumstances unconnected with Leibnitz, this project did not succeed; but every mark of consideration was lavished on the author. The emperor had already named him an aulic councillor; to this he now added a pension of two thousand florins, and employed every means to induce him to enter the imperial service. But Leibnitz, having declined these offers, went to fix his abode at Hanover, the elector of which had just been called to the throne of England.

In 1710 there appeared a volume of the *Miscellanea Berolinensia*, in which Leibnitz amply acquitted his debt as founder and president, and showed himself under forms so varied, that this volume alone would have been sufficient to insure him the reputation of universal genius. In proof of what is here said, it is only necessary to refer to his Essay on the Origin of Nations. This production exhibits the principal points of his system, a complete knowledge of which may be obtained by the perusal of his voluminous correspondence. By the aid of etymologies, and by means of analysis, Leibnitz endeavours to distinguish, through the successive alterations of languages, the origins of different nations, whom he divides into two great principal races,—that of the North and that of the South; then, by way of synthesis, he attempts to recompose the primitive language; and, finally, by means of this last operation, he labours to discover the relations between the signs of language and the ideas expressed by them. A great part of his labours had for their object to obtain these different results; he had himself plunged into the chaos before which almost all those who are more occupied with ideas than with words usually recoil: it formed one of the principal objects of his correspondence with the learned, as well as with travellers and missionaries; and new views on the language of the Copts or the Hottentots afforded him as much pleasure as the demonstration of a metaphysical truth, or the solution of an important problem in geometry. He is not always of the same mind with other learned men, and often contradicts received opinions. Like all etymologists, he has placed too much reliance upon fanciful coincidences and strained derivations; but, as he himself observed, errors are often useful to truth, and the search after the three great chimeras (*tria magna inania*), the philosopher's stone, the perpetual motion, and the quadrature of the circle, materially contributed to enrich the sciences.[1]

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[1] *Disquisitio de Francorum origine*, Hanover, 1715, in 8vo.

[2] *Histoire de Bossuet*, tom. iv. p. 144, 2d edit.

[3] See his second letter to Madame Brinon, *Opera*, tom. v. p. 558.

We have seen that Leibnitz succeeded in stamping the impression of his genius upon almost all kinds of knowledge. Natural history alone did not specially occupy his attention. His *Protogæa* is the only essay which he published on the subject; but in his works we often meet with proofs of the interest with which that science had inspired him; and it is not forgotten either in his general plans of education, or in his encyclopedical schemes. He was even a poet, and wrote verses in both the languages which he habitually employed; but it is right to add, that he acquired no illustration by his poetry, particularly his French verses, which are below mediocrity. Leibnitz is justly obnoxious to the literary reproach of having neglected his mother-tongue. But few of his writings appeared in German; and, what is not a little singular, the object of one of these pieces, which is very ill written, but exceedingly curious, is to recommend the study, practice, and improvement of the German language.[2] It is the more to be regretted that he did not himself labour in the execution of the plan which he proposed for attaining this object, as he might, by his influence, have effected that which was not accomplished until half a century afterwards, by the united efforts of the poets and literary men who distinguished that epoch. Besides, although he attaches great importance to that language, he does not appear to have understood its resources or its flexibility; for, in citing French Sapphic verses, he adds, that he does not believe a similar attempt would succeed equally well in German, although he had himself composed German anapests, in imitation of those of Seneca. In justification of Leibnitz, however, it is proper to add, that, being in correspondence with men of all nations, he naturally adopted the two languages, Latin and French, which were then in general and almost exclusive use.

His Latin style is neither elegant nor agreeable. Sometimes, however, he rises with his subject, and assumes a certain degree of majesty; but what may appear singular is, that we frequently meet with Gallicisms in his Latin compositions. We are less surprised to find Germanisms in his French prose; but these, however, are of rare occurrence. What strikes us most in his general style, is that grand and noble simplicity which distinguishes the French writers of the same period, and which is equally suited to pure reason and to sublime conceptions. In his works, as in his correspondence, there is an almost total absence of ornament. The most simple literary correspondence of the present day would exhibit more brilliancy and point than that of this great man; but, on the other hand, there is not one of his letters which does not contain the germ, the expression, or the development of some great or useful idea. Those of greatest extent commonly exhibit a sort of abridged or epitomized encyclopedical view of the state of the sciences, or the labours of the learned. But what we are never weary of admiring is his constant urbanity towards his correspondents, as well as the moderation and propriety exhibited in the expression of his judgments, whatever may be their occasional severity. No personal predilection, no national prejudice, ever disturbs the impartiality of that genius which viewed every thing as it were from on high. Embracing, so to speak, entire humanity, he incessantly recommends sending European missionaries into foreign countries, for the triple purpose of augmenting the amount and variety of our knowledge, establishing new commercial relations, and, above all, propagating the faith and the doctrine of Christianity. "Peu lui importe," says his French biographer, "que cette doctrine soit enseignée aux étrangers avec moins de pureté (on ne doit pas oublier que c'est un Luthérien qui parle), pourvu qu'elle se répande; et pour le succès des missions aux Malabar, entre autres, il conseille d'amener en Europe des habitants de cette côte, qui puissent y enseigner leur langue à des missionnaires Européens."

Leibnitz had a sweet expression of countenance, blended with a studious air; he possessed considerable gaiety, and his conversation was equally easy and instructive. His temper was naturally choleric; but, like most passionate men, he soon recovered his equanimity. Affable and communicative, he conversed freely with all who came in his way, and even carried his complaisance so far as, according to Fontenelle, to read a multitude of worthless books, out of politeness to their authors. He was never married. At the age of fifty he had some thoughts of forming a matrimonial connection; but as the lady he wished to espouse desired time to consider his proposal, Leibnitz also made his own reflections on the subject, and unluckily came to the conclusion that, though marriage is a good thing, a wise man ought to consider of it all his life. Much has been said of his avarice, but apparently without any sufficient reason. There is no doubt that his expenditure was exceedingly frugal; but he had no expensive passions or tastes to satisfy, and it is probable that his money accumulated without his being aware of it. The reproach of not having attended the service of his religion appears to be better founded. Nevertheless, he was equally attached to the forms and the substance of religion; and though he may have been wanting in punctuality of attendance, there is no ground whatever for questioning the sincerity of his sentiments. De Murr, in his *Journal of Nuremberg*, of the 11th March 1779, gives entire the Memoir of Eckhard, from which Fontenelle has derived most of the particulars inserted in his Eloge de Leibnitz. It is there stated, that Leibnitz was of a middle stature, and had black hair, a large head (which early became bald), and small eyes. He was short-sighted, but his vision continued excellent even until his last moments. He read the smallest characters, and his hand-writing was very minute. He had on the crown of his head an excrescence of the size of a pigeon's egg; and he always walked stooping, with his head projected, which gave him the appearance of being hunch-backed. He was of a thin habit, but of a vigorous temperament; he drank little, supped plentifully, and went to rest immediately after. He remained in bed only a few hours; sometimes he contented himself with sleeping in a chair, and, awaking about six or seven in the morning, instantly resumed his labours. When deeply immersed in study, he was known to have scarcely quitted his chair for weeks. But, however strong his constitution might be, it could not, in the long run, escape being undermined by a life so sedentary; in fact, the result was an ulcer in one of his legs. He was, besides, subject to the gout, the attacks of which became more frequent and painful towards the close of his life. He consulted few physicians; and his death appears to have been occasioned by blindly using a remedy which he had received from one of his friends, and which, producing violent spasms, terminated his existence in little more than an hour after he had swallowed it. He died on the 14th of November 1716, at the age of seventy. His monument, constructed in the form of a small temple, at the extremity of the great alley leading to the gates of Hanover, bears the simple inscription, *Ossa Leibnitii.*

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[1] *Opera Omnia*, tom. iv. p. 199.

[2] See some remarks prefixed to his *Collectanea Etymologica*, in *Opera Omnia*, tom. vi. p. 651.

This extraordinary man is, beyond contradiction, one of those who have most highly exalted and ennobled the human understanding. But if he has merited our admiration by the astonishing variety of his labours, he is still more deserving of our gratitude on account of that practical activity which had always for its object the good of his fellow-creatures. Along with his most profound meditations, are presented the means which indicate their utility, and facilitate their application. His letters to Madame Brinon, his judgments on Shaftesbury, the whole of his correspondence, and a thousand passages in his writings, attest his profound respect for religion and morality; and he crowned his glorious life by giving, in his *Theodicæa*, the support of his influence to ideas at once the most sublime and the most necessary to the welfare of humanity. None of his labours was without glory to himself, or without advantage to society. His reputation would perhaps have been more solid and permanent had he less ambitiously grasped the whole circle of human science; yet it is difficult to name any department of human knowledge which has not profited by his labours, or received fresh illustration from his genius. As a theologian, he successively contended with the sceptics who believed too little, and with the Catholics, who, in his opinion, believed too much; with the heretics, who believed otherwise than was inculcated by the confession of Augsburg; and with the Arminians, who contended for the liberty of indifference. Yet the philosopher betrayed his love of union and toleration. In conjunction with the illustrious Bossuet, he laboured zealously to effect a reconciliation between the Catholic and Protestant churches; and if he failed in this truly Christian enterprise, his sincerity and good faith remain unimpeached; for, whatever may be thought of the selfish and worldly policy of the elector of Hanover, there can scarcely be but one opinion as to the purity of the motives which actuated Leibnitz. In an intolerant age, however, his orthodoxy did not escape suspicion; and the moderation which reflects so much honour on his memory was construed as indifference. His faith in revelation itself was accused, because he attempted to prove the doctrine of the Trinity by the principles of logic; and in the defence of the attributes and providence of the Deity, he was suspected of a secret correspondence with his adversary Bayle. As a metaphysician, he expatiated in regions too elevated ever to be explored by human genius and intellect. His pre-established harmony of the soul and body, if an untenable, is at least a sublime conception, and, as such, might have excited the jealousy of Plato himself; whilst his optimism, or the best of all possible worlds, seems an idea too vast for a mortal mind, and too beneficent for the actual condition of humanity. He was a natural philosopher, in the large and genuine acceptation of the term; and if, like some others, he amused himself with endeavouring to penetrate the mysteries of cosmogony, his *Protogæa*, or primitive earth, has not been useless to Buffon, and those who have succeeded him, in investigating the changes which have taken place in the constitution of the globe, and tracing the causes or agents to which these are to be attributed.

"I am not worthy," says Gibbon, "to praise the mathematician; but his name is mingled in all the problems and discoveries of the times; the masters of the art were his rivals or disciples; and if he borrowed from Sir Isaac Newton the sublime method of fluxions, Leibnitz was at least the Prometheus who imparted to mankind the sacred fire which he had stolen from the gods. His curiosity extended to every branch of chemistry, mechanics, and the arts; and the thirst of knowledge was always accompanied with the spirit of improvement. The vigour of his youth had been exercised in the schools of jurisprudence; and while he taught, he aspired to reform the laws of nature and nations, of Rome and Germany. The annals of Brunswick, and of the empire, of the ancient and modern world, were presented to the mind of the historian; and he could turn from the solution of a problem to the dusty parchments and barbarous style of the records of the middle age. His genius was more nobly directed to investigate the origin of languages and nations; nor could he assume the character of a grammarian without forming the project of an universal idiom and alphabet. These various studies were often interrupted by the occasional politics of the times, and his pen was always ready in the cause of the princes and patrons to whose service he was attached; many hours were consumed in a learned correspondence with all Europe; and the philosopher amused his leisure with the composition of French and Latin poetry. Such an example may display the extent and powers of the human understanding, but even *his* powers were dissipated by the multiplicity of his pursuits. He attempted more than he could finish; he designed more than he could execute: his imagination was too easily satisfied with a bold and rapid glance on the subject, which he was impatient to leave; and Leibnitz may be compared to those heroes, whose empire has been lost in the ambition of universal conquest."

Variety in unity, or unity varied, the expressive sign of every masterpiece of nature and of art, characterizes happily enough the productions of the genius of Leibnitz: extreme variety in the number and the species of the ideas with which he enriched the intellectual world, of the truths which he discovered or demonstrated, and of the elements of every order which he combined: absolute unity of principle, of method, of plan, and of object or aim, in this great and beautiful system, which connects and harmonizes the two worlds, spiritual and material, by subjecting them to the unity of a monarchy constituted under the government of the greatest and best of sovereigns. If we consider the *form* under which the different productions of this fertile genius present themselves, as detached pieces, or as fragments disseminated in vast collections, the mind is at first struck with their prodigious variety; and it is in this point of view that they most commonly appear, not only to biographers, but frequently to the historians of philosophy. But he who regards them in this light alone, will absolutely fail to discover the total and harmonious effect of this grand and beautiful scenography, or will only obtain partial views, and glimpses without any sequence or connection. The philosophical works of Leibnitz form a body of *doctrine*, the parts of which, whatever be their number or diversity, are nevertheless intimately connected, and all referrible to the same principles, as well as animated by the same spirit. This spirit, diffused throughout each of his numerous productions, pervades equally the works of the jurisconsult, the historian, the theologian, the natural philosopher, and the mathematician.[1] In proof of this, as far as regards the philosophical system of Leibnitz, it is only necessary to refer our readers to the ample and masterly exposition of it contained in the First Preliminary Dissertation to this work (part second, sect. ii. p. 122, et seq.), where the philosopher will find abundant aliment for thought, and the man of taste will discover new sources of gratification, in the splendid combination of genius, eloquence, and philosophy.

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[1] See a very eloquent and learned exposition of the Philosophical System of Leibnitz, annexed to the life of that illustrious man in the *Biographie Universelle*, art. LEIBNITZ.

In like manner, with reference to the mathematical labours of Leibnitz, and more particularly his claim to the discovery of the differential calculus, it is only necessary for us to direct the reader to the Third Preliminary Dissertation (part second, sect. i. p. 517, et seq.) where the subject generally is treated with profound science and consummate ability, and the claims of Leibnitz to the discovery in question are weighed and judged with that perfect candour and judicious discrimination, which ought ever to guide such decisions. In recent times, however, a new competitor for the honour of this discovery has been brought forward by no less distinguished a personage than Laplace. "Il paraît," says he, in his *Essai Philosophique sur les Probabilités*, "que Fermat, *le véritable inventeur du calcul différentiel*, a considéré ce calcul comme une dérivation de celui des différences finies." Against this affirmation, however, Professor Playfair, in his review of Laplace's *Essai*, enters a strong and solemn protestation. "The age in which that discovery was made," says he, "has been unanimous in ascribing the honour of either to Newton or Leibnitz; or, as seems to us much the fairest and most probable opinion, *to both;* that is, to each independently of the other, the priority in respect of time being somewhat on the side of the English mathematician. The writers of the history of the mathematical sciences have given their suffrages to the same effect;—Montucla, for instance, who has treated the subject with great impartiality, and Bossut, with no prejudices certainly in favour of the English philosopher. In the great controversy to which this gave rise, all the claims were likely to be well considered; and the ultimate and fair decision, in which all sides seem to have acquiesced, is that which has just been mentioned. It ought to be on good grounds, that a decision passed by such competent judges, and that has now been in force for a hundred years, should all at once be reversed." He then proceeds to show that there are no such grounds, and concludes by observing, "Great as is the merit of Fermat, which nobody can be more willing than ourselves to acknowledge, and near as he was to the greatest invention of modern times, we cannot admit that his property in it is to be put on a footing with that of Newton or of Leibnitz;—we should fear that, in doing so, we were violating one of the most sacred and august monuments that posterity ever raised in honour of the dead."[1]

For the most extensive collection of the works of Leibnitz, we are indebted to Louis Dutens, who in 1768 published at Geneva, *Go. Gul. Leibnitii Opera Omnia*, in six vols. 4to. The first volume contains the *Opera Theologica*, amongst which are the *Theodicæa* in the Latin translation, and the tracts in controversy with Bossuet; the second includes the writings relative to logic, metaphysics, general physics, chemistry, medicine, botany, natural history, the arts, &c. particularly the *Meditationes*, the treatise *De Primæ Philosophiæ Emendatione*, the *Principia Philosophica*, and the Correspondence with Dr Clarke; the third is devoted to mathematics; and the three remaining volumes contain the writings of Leibnitz on history, antiquities, jurisprudence, philology, etymology, the Chinese, &c. Dutens, however, excluded from his collection all that had been published by Rud. Eric. Raspe at Amsterdam in 1765, 4to, under the title of *Œuvres Philosophiques de M. Leibnitz, tirées des ses manuscrits*, viz. 1. Nouveaux Essais sur l'Entendement Humain, intended as a refutation of Locke; 2. Examen du Sentiment de Malebranche, *Que nous voyons tout en Dieu;* 3. Dialogus inter Res et Verba, and some other small treatises on logic and the *Caractéristique Universelle*. Those who wish to possess all that has appeared from the pen of Leibnitz, must add to these two collections, 1. Essais de Théodicée, sur la bonté de Dieu, la liberté de l'homme, et l'origine du mal, Amsterdam, 1716; 2. Epistolæ ad diversos, cum notis Kortholti, Leipsig, 1734–1742, in four vols. 8vo; 3. Jo. Dan. Gruberi Commercium Epistolicum Leibnitzianum, Hanover, 1745, in two vols. 8vo; 4. Leibnitzii et J. Bernoullii Commercium Philosophicum et Mathematicum, editum a Cramer, Geneva, in two vols. 4to; 5. His Correspondence with Jablonski, published by Professor Kappe, Leipsig, 1745, in 8vo; 6. Epistolæ ad Schmidium, theologum Helmstadiensem, quas evulgavit Wesenmeyer, 1788; 7. Lettres choisies de la Correspondance de Leibnitz, publiées pour la première fois par G. H. Feder, Hanover, 1805, in 8vo; and, 8. A kind of *Leibnitziana* in the *Otium Hanoveranum*, 1718, in 8vo. The historical collections published by Leibnitz during his life were, 1. Codex Juris Gentium diplomaticus, Hanover, 1693, in folio; 2. Mantissa Codicis Juris Gentium diplomat. ibid. 1700, in folio; 3. Scriptores Rerum Brunsvicensium, ibid. 1707–1711, in three vols. folio; 4. Accessiones Historicæ, Leipsig, 1698–1700, in two vols. The number of works that have been published in relation to or in connection with Leibnitz, is immense, and therefore precludes any attempt at enumerating them. (A.)

LEICESTER, a town, the capital of the county of the same name, ninety-eight miles north of London. It is situated on the river Soar; but, by means chiefly of canals, has the means of conveyance to every part of the kingdom. It is an ancient town, said to have been built by King Lear, and was a place of strength when England was invaded by the Romans. It appears by Doomsday Book, that at the Norman conquest, it was a city, and populous. In the reign of Henry V. a parliament was held here. Richard III., after his defeat and death, was buried in a Franciscan convent, which then stood near St Martin's Church. The town was formerly fortified, and the remains of the wall may now be in many parts distinctly traced. The castle was a most extensive building; and though a great part of the ground upon which it stood is now covered with good dwelling-houses, other parts are entire, and a portion is appropriately made of use for courts of justice at the county assizes. Leicester is divided into six parishes, and the castle, which is extra-parochial. It contains six churches, and twenty-one chapels for dissenters of the different denominations. It is a corporate town; and its government, under the provisions of the municipal corporation act, consists of a mayor, recorder, high bailiff, forty-two councilmen, fourteen aldermen, ten magistrates, town-clerk, and other officers, with an efficient police. It sends, as before, two members to the House of Commons. The chief employment of Leicester is the manufacture of hosiery goods, long consisting of worsted and thread stockings, to which afterwards cotton hose were added, and of late years hose of silk. But within a very few years a large quantity of gloves of cotton have been made. The lace trade is also carried on to a very considerable extent. The smaller branches of trade, such as braces, cravats, tapes, children's fancy worsted boots and shoes, and other articles, are all in the most prosperous condition. The winding and sewing of cotton has also been carried on for several years, and is now arrived at the highest state of perfection. This part of the trade gives employment to vast numbers of young females, who are amply paid by their employers.

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[1] *Edinburgh Review*, vol. xxiii. pp. 324, 325. See also M. Biot *Sur les Travaux Mathématiques*, annexed to the article LEIBNITZ in the *Biographie Universelle;* an exposition which contains a very full and distinct, though not altogether unprejudiced, view of the controversy above referred to.

The price of coals has been very much reduced of late years, in consequence of a new railway, constructed about four years ago, by which coals are conveyed from the northern part of the county. This has caused an active competition between the Leicestershire and Derbyshire coal-owners; and the reduction in the price of fuel has induced the manufacturers to erect steam-engines, which are employed in combing wool, spinning worsted, and other branches of trade. There are few towns in which are to be seen so very many charitable institutions for the relief of poverty, age, sickness, and general distress, and for the gratuitous instruction of the inferior classes. The country around is highly fertile, and the markets, held on Wednesday and Saturday, are amply and cheaply supplied. The population has rapidly increased, amounting in 1801 to 16,953, in 1811 to 23,146, in 1821 to 30,125, in 1831 to 39,306, and being at the present time (1836) not fewer than 44,000. The town has been greatly improved by the removal of old houses, and the erection of new ones. Several public buildings are in progress, viz. a new county lunatic asylum, and a reading and news-room, to be supported by subscriptions; a new theatre, and two new schools.

LEICESTERSHIRE, an English inland county. It is bounded on the north by Nottinghamshire and Derbyshire, on the west by the latter county and Warwickshire, on the south by Northamptonshire, and on the east by Rutlandshire and Lincolnshire. It is of a triangular form, and few of its limits are marked by nature, as the rivers Soar and Trent form only a part of its northern boundary, and the river Anker a smaller portion of its western frontier. Its greatest length from north to south is forty-five miles, and its greatest breadth from east to west thirty-five miles. Its area contains 816 square miles. It is divided into six hundreds, in which are ten towns and 196 parishes. The population at the four decennial enumerations has been estimated as follows:—In 1801 it amounted to 130,081, in 1811 to 150,419, in 1821 to 174,571, and in 1831 to 197,000. The annual value of the real property, as assessed in the year 1815, was L.902,217. The burials, including both the registered and unregistered, in the period from 1821 to 1831, appear to have been only one in fifty-two of the whole number of inhabitants then living. The proportion of illegitimate to legitimate births was only one to twenty-eight, whereas, in the whole of England, it was one to twenty. The occupations of the inhabitants are thus shown by Mr Rickman.

Occupiers of land employing labourers	2,656
Occupiers of land not employing labourers	2,145
Labourers employed in agriculture	10,542
Ditto employed in manufacture	12,240
Employed in retail trade or handicraft	13,772
Capitalists, bankers, &c	1,421
Labourers not agricultural	3,701
Other males twenty years of age	2,509
Male servants	1,164
Female servants	5,994

The chief towns of the county, and their population in 1831, were,

Leicester	39,306
Loughborough	10,800
Hinckley	6,468
Ashby-de-la-Zouch	4,400
Melton-Mowbray	3,356
Donnington Castle	3,182
Market-Harborough	2,272
Wigston Magna	2,174

The county of Leicester may be described generally as a level district, the undulations of which are very gentle, and exhibit but few interesting prospects. The exceptions to this remark are the Charnwood Hills, on the northern part of the county, which rise in an insulated mass, and from the summit of which the rest of the county appears extended in a well-wooded but even surface under the feet. The most lofty eminence of this range of hills (commonly denominated the *Forest*, though it is destitute of trees) is Bardon Hill, the summit of which is 850 feet above the level of the sea. The Vale of Belvoir, in which the castle of the Duke of Rutland stands, displays much beauty, of a soft rather than a romantic or picturesque character.

None of the rivers of this county are considerable streams, nor are any of them calculated for the conveyance of commodities, except the Soar, for a short distance; but they are abundant, and contribute to increase the beauty and fertility of the district. Their names are, the Anker, Avon, Blackbrook, Deane, Eye, Scalford, Sence, Snite, Soar, Swift, Trent, Willand, and Wreke. The intercourse of the county, both in its own different districts, and with the surrounding parts of the kingdom, is amply provided for by several navigable canals. One of these connects the town of Leicester with the Grand Junction Canal, in Northamptonshire; another communicates by Loughborough with the river Trent; another from the coal-mines near Ashby-de-la-Zouch, passes by Hinckley, and proceeds into Warwickshire; and one is designed to connect Melton-Mowbray with the centre of Rutlandshire.

Though the soil is various, yet, in general, it may be classed under the denominations either of clay or of loam; for there are very few portions of it that are calcareous, sandy, or gravelly. The best soil is on the hills, and generally the valleys consist of a cold clay, very wet in the winter, and with the turf so tender as scarcely to bear the treading of sheep in that season. The soil is naturally productive of the best and most abundant crops of grass, and is better fitted for feeding cattle than for arable culture. In consequence of this quality, a very small portion is under the plough; but that portion produces most excellent wheat, oats, and beans, which have acquired great celebrity. There are few open fields now remaining, and the quantity of waste land is very small. The principal productions of the county are sheep and cows. Mr Bakewell, whose fame in improving the breeds of all cattle is generally known, has been the means of stocking this county first, and afterwards many other parts of England, with a race of sheep produced by various crosses, which by many farmers is now preferred to every other, and universally known by the name of the *new Leicesters.* They unite perfect symmetry of shape with the smallest possible quantity of bone and offal, and their wool is both fine and abundant. The horned cattle were, in like manner, improved by the lessons of this skilful breeder; and no part of England exceeds Leicestershire either in its beef or in the produce of the dairy. The cheese commonly made is in great request throughout all the north of England; and the kind called Stilton, from having been first sold in that town, though made near Melton-Mowbray, is perhaps the richest in the world. The process of making it was long kept a secret in a few villages, but is now universally known. Its richness arises from one half the milk being skimmed, and the cream taken from that added to the other milk, so that the cheeses have double the usual quantity of cream in their composition. Bakewell improved also the breed of horses to a great extent. In this line there was less room for any extraordinary progress; but his black horses, of the cart kind, originating principally from mares which he brought from Flanders, enabled him to introduce the method of ploughing with two horses abreast, by which much labour in agriculture has been saved.

The manufacture of most consequence in this county is

Leicestershire.

that of hosiery, which gives employment, more or less constant, to two thirds of its inhabitants. The quantity of stockings made here is prodigious, and supplies the greater part of the British dominions, as well as many other parts of the world, with those of an inferior and middling quality. Stocking-frames were invented about 1590; but the first introduced in Leicestershire was used at Hinckley in 1640. Since that period many improvements in the machinery of them have been made. The chief seat of this manufacture is in the town of Leicester, in which there are 3400 manufacturers, of whom 3000 are stocking-makers. Loughborough has 900, Hinckley 700, Sheepshead 500, Wigston and Shilton 280 each; and in many of the smaller places there are to be found to the number of from 100 to 200 weavers of hosiery and gloves. About 700 men are employed in making lace, chiefly at Melton-Mowbray and Quornden. The makers of machinery are numerous, and in the county some linen is manufactured, and also some carpets. The making of stuffs at Harborough has nearly disappeared.

In the north-west part of the county there are extensive mines of valuable coal, which supply the inhabitants of the surrounding districts. With them terminate the mines in the direction of the German Ocean to the southward. At Bredon, on the confines, the singular rock called Bredon Hill is composed of a most valuable kind of limestone, which forms an excellent cement in water, and which was used for building the pier of Ramsgate.

The Roman roads are still visible in many parts of the county, though in many instances they have been covered by the more recent highways. The Watling-Street road, the Fossway, and the Via Davana, traversed the county, and have been traced with great accuracy by antiquaries. At Radcliffe, on the Wreke, is an ancient tumulus, generally attributed to the Celts, 350 feet in length, and 120 in breadth. At Leicester, which was a Roman station, are still visible the remains of the architecture of that people, in what is called the Jewny Wall, consisting of a mass of stones, brick-work, and dilapidated arches, built in alternate courses of brick in three layers, and of stone. Near the town is the vestige of a British Cursus, according to some antiquaries, or of a Roman camp, according to others. At different and distant periods a great number of coins have been discovered, with the names of Titus, Trajan, Diocletian, Constantine, Constantius, Hadrian, and other Roman emperors. Other Roman antiquities have been found at Rothley, at Wanlip, at Market-Harborough, at Burrow, and at Cathorpe. The Gothic remains are considerable; those of the Abbey of Leicester, of the Nunnery of Grace Dieu, Ulvestoft Priory, Laund Priory, the Castle of Ashby-de-la-Zouch, the churches of Hinckley and Melton-Mowbray, and the chapel of Market-Harborough, all reward the inspection of the antiquary.

In the church of Lutherworth, the pulpit and part of the vestments of the great reformer Wickliffe are still preserved. He was buried there in the year 1387; but in 1428, his bones were taken up and burnt, and the ashes thrown into the river, by order of the council of Sienna. Leicestershire has been the scene of two great military events, which have been the means of transferring the government of England; the first, the battle of Bosworth, which terminated the reign and life of Richard III. in 1485; and the other, the battle of Naseby in 1645, which led to the death of Charles I., and the subsequent elevation of Oliver Cromwell.

One of the chief distinctions of this county is its adaptation for fox-hunting, which has given rise to establishments for that purpose at the town of Melton-Mowbray, where, at the appropriate season, are collected the best horses, dogs, and riders that England produces, and where, also, may be seen some of the most wealthy and distinguished of the nobility and gentry.

By the reform bill this county received an addition of two members to the House of Commons; for which purpose it is divided into two parts, the northern and southern divisions. The polling-places for the former are Loughborough, Melton-Mowbray, and Ashby-de-la-Zouch; and for the latter, Leicester, Market-Harborough, and Hinckley. The town of Leicester, as before, returns two members.

LEIGH, a town and port, with a custom-house, of the hundred of Rochford, in the county of Essex, thirty-nine miles from London. Here much corn is shipped for the supply of the metropolis. The population amounted in 1801 to 570, in 1811 to 702, in 1821 to 905, and in 1831 to 1254.

LEIGH, a large parish, consisting of two chapelries and four townships, in the hundred of West Derby, in the county of Lancaster, 198 miles from London. It is placed conveniently for water communication with most of the great rivers of the kingdom; from which, and the great extension of the cotton trade, its population has been rapidly augmented. The inhabitants amounted in 1801 to 12,976, in 1811 to 15,565, in 1821 to 18,372, and in 1831 to 20,083.

LEIGHLIN, a decayed town of Ireland, situated in the county of Carlow, about forty-three miles from Dublin, near the river Barrow. It is a borough, and formerly returned two members to the Irish parliament. The patronage is in the bishop of the diocese, this being a bishopric united to Ferns.

LEIGHTON, ROBERT, a prelate of eminent talents and learning, and of the most exalted piety, was born in the year 1611. His father, Alexander Leighton, a descendant of the ancient family of Ulyshaven in Forfarshire, commenced his academical studies at St Andrews, and afterwards repaired to Leyden, where he took the degree of M. D. That he ever took the degree of D. D. seems to be asserted without sufficient evidence: as he became a clergyman, it was apparently taken for granted that he must have proceeded in the theological faculty. That he never was a professor of philosophy in the university of Edinburgh, is still more certain. Dr Leighton fixed his residence in London, where he betook himself to the practice of physic, but met with strong opposition from the college of physicians. He was however doomed to encounter persecution in a more appalling form. His indignation was violently moved by the lordly pretensions and popish practices of the bishops of those days; and he was induced to prepare an elaborate volume, under the title of *Sions Plea against the Prelacie*, in which his indignation was very strongly expressed. With the view of conducting his work through the press, he retired to Holland; and we find that the year 1629 he became minister of the English church at Utrecht. But his conscientious scruples respecting the observance of the appointed festival days, which he doubtless regarded as a remnant of superstition, induced him to resign his charge within the space of a few months.[1] His book having been printed in the course of the preceding year,[2] he returned to London. Two copies were presented to parliament two days before its dissolution; and it was immediately perceived that the author had treated the bishops with uncompromising severity, describing them as men of blood, and maintainers of superstitious worship and antichristian government. This last position was verified by the inhuman treatment to which he was himself subjected. He was soon afterwards arrested by two pursuivants of the high commission, and was first conducted to the house of Dr Laud, who was then bishop of London, and who may with sufficient propriety be described as the inquisitor general of England. On the bishop's warrant he was committed to a dark, cold, and loathsome dungeon in Newgate, to a place not fit for the reception of a Christian's dog, and there he was kept, without meat or drink, from Tuesday night to Thursday at noon. It was only after a dismal interval of fifteen weeks that the inquisitors would permit even his wife to visit him. Four days after his commitment, she had been treated with the most barbarous inhumanity and indecency by a pursuivant and other ruffians, who were sent to ransack his house, under the pretext of searching for Jesuits books. They presented a pistol to the breast of a boy five years of age, threatening to shoot him if he did not inform them where the books were to be found; "and so affrighted the poor child, that he never recovered it all his days." They not only carried off books and manuscripts, but robbed the house of arms, clothes, and furniture. His wife had sufficient courage to remind them that a day of reckoning might yet come; and come it did, in a signal manner, to the chief authors and abettors of such flagitious proceedings. Some of Laud's emissaries infested him in Newgate; and, by means of flattering and deceitful promises, one of them prevailed upon him to confess that he was the writer of the book in question. During a subsequent visit, he offered to procure him pardon and favour, on condition of his disclosing the names of those who had encouraged him to write; but although nearly five hundred individuals had, by their subscriptions, testified their approbation of Sions Plea, he had too much magnanimity to betray any one of his friends and adherents. After this refusal, he was brought before the court of Star-Chamber, and required to answer a long information, setting forth his many and grievous offences. He admitted that he was the author of the book, but denied all criminality of intention. No counsel dared to plead his cause, and he returned to prison in order to await his doom. It was the opinion of four physicians that poison had been administered to him in Newgate. He had been seized with a violent distemper, which was accompanied with loathsome symptoms, and his strength was so completely exhausted that he could not be produced before this atrocious court. In his absence the following sentence was unanimously pronounced on the 4th of June 1630: that Dr Leighton should pay a fine of L.10,000; that the high commission should degrade him from his ministry; that he should be brought to the pillory at Westminster during the sitting of the court, and should there be whipped; that after whipping he should be set upon the pillory for a convenient time, should have one of his ears cut off, one side of his nose slit, and his face branded with the letters S. S. denoting a Sower of Sedition; that he should then be carried back to prison, and, after an interval of a few days, should again be pilloried at Cheapside, should then likewise be whipped, have his other ear cut off, and the other side of his nose slit; and should then be detained in close custody in the Fleet-prison for the remainder of his life. When this sentence was pronounced, it has been stated that Laud pulled off his cap, and gave thanks to the God of mercy; nor does such an act appear to be in any respect inconsistent with the general character of the ferocious and unrelenting bigot to whom it is imputed.[1] This is the same individual whom the high-churchmen of our own times describe as an excellent prelate. Between the passing and the execution of the sentence, Leighton made his escape from prison; and two of his countrymen, named Anderson and Elphinstone, were each fined L.500 for aiding and abetting him in his flight. He was however retaken in Bedfordshire; and, before the expiration of a fortnight, having again been committed to the Fleet, he endured the first part of his punishment on the 26th of November: it was inflicted with the most unrelenting severity; the second part followed after a short interval; and his bodily frame having thus been miserably shattered, he lingered in prison for the tedious space of nearly ten years.[2] In 1640 he presented a petition to the long parliament, reciting the direful persecution to which he had been subjected, and he now obtained such redress as could be afforded to him; "but," as Dr Benson has too truly remarked, "no sufficient reparation, in this world, could possibly be made to a man so highly injured."[3]

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[1] Steven's History of the Scottish Church, Rotterdam, to which are subjoined Notices of the other British Churches in the Netherlands, p. 339. Edinb. 1833, 8vo.

[2] An Appeal to the Parliament; or Sions Plea against the Prelacie: the summe whereoff is delivered in a decade of positions, in the handling whereoff the Lord Bishops and their appurtenances are manifestly proved, both by divine and humane lawes, to be in-

Robert Leighton, the eldest son of this learned and persecuted individual, is commonly represented as a native of Edinburgh; but as Burnet speaks of his father's having sent him to be educated in Scotland, it has been inferred that he was born in London.[4] The name of his mother we have not found recorded, but it is certain that he was of the issue of the first marriage. His father's second wife was Isabel the daughter of Sir William Musgrave of Ireby in Cumberland, and she had previously been married to William Calverley, and Ralph Hopton, Esq.[5] After the death of her third husband, she retired to the neighbourhood of Leeds; and she appears to have been left in very comfortable, if not affluent circumstances. Her stepson was educated in the university of Edinburgh, and became one of its brightest ornaments. He "was accounted a saint from his youth up;" but he seems originally to have had, what the readers of his works could not easily have supposed, some slight propensity to satire. He in-

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truders vpon the priviledges of Christ, of the King, and of the Common-weal; and therefore, vpon good evidence given, she hartelie desireth a iudgement and execution. *Printed the year and moneth wherein Rochell was lost.* 4to.

[1] Even in the solitude of his prison, Laud seems to have entertained a deliberate opinion that Dr Leighton's punishment had fallen short of his deserts. "In which book of his," he remarks very coolly, "were many things, *which in some times might have cost him dearer.*" (Hist. of the Troubles and Tryal of Laud, vol. i. p. 198.) The archiepiscopal palace was converted into a state-prison, of which Leighton was appointed keeper; and this amiable prelate felt it as a great trial of his patience, that a person who had thus "been censured in the Star-Chamber," should come with a warrant from the House of Commons to demand the keys. See likewise p. 203, and Dr Nalson's Collection, vol. i. p. 512.

[2] Rushworth's Historical Collections, part ii. p. 58. Oldmixon's Hist. of England during the Reigns of the House of Stuart, p. 110. Pierce's Vindication of the Dissenters, p. 177. Neal's Hist. of the Puritans, vol. ii. p. 209. Toulmin's edit. Brook's Lives of the Puritans, vol. ii. p. 476. Brodie's Hist. of the British Empire, vol. ii. p. 308.

[3] Benson's Brief Account of Archbishop Laud's cruel Treatment of Dr Leighton, inserted in the third edition of his Collection of Tracts, p. 224. Lond. 1748, 8vo.

[4] Murray's Life of Robert Leighton, D. D. Archbishop of Glasgow, p. 42. Edinb. 1828, 12mo.

[5] Thoresby's *Ducatus Leodiensis*, or the Topography of the ancient and populous Town and Parish of Leedes, p. 97. Lond. 1715, fol. See likewise p. 57. He elsewhere states that he was employed in "writing Memoirs of the charitable Madam Leighton, and her admirably pious son-in-law, Archbishop of Glasgow." (Diary of Ralph Thoresby, F.R.S. vol. ii. p. 10. Lond. 1830, 2 vols. 8vo.)

curred some degree of academical censure, for writing an epigram on the provost of the city, whose name was Aikenhead. The point of it is, "his head cannot be made of oak, or his fiery nose would have produced combustion."[1] That he made uncommon progress in his studies, is sufficiently evident from his works. He took the degree of A. M. in the year 1631. After he left the university, his father, who was then groaning under the rod of the oppressor, sent him to travel on the continent, and he thus enlarged his knowledge of men and manners. Among other places, he visited Douay, where some of his relations were then residing. In France he spent several years, and learned to speak the language like a native. Returning to the land of his fathers, he became a clergyman of the presbyterian church, having on the 16th of December 1641 been ordained minister of Newbattle, a parish within seven miles of Edinburgh. He had now attained the age of thirty, and was qualified by his natural endowments, as well as by his acquired knowledge, to appear with singular advantage in his public capacity. "His preaching," says Bishop Burnet, "had a sublimity both of thought and expression in it. The grace and gravity of his pronunciation was such, that few heard him without a very sensible emotion: I am sure I never did. It was so different from all others, and indeed from every thing that one could hope to rise up to, that it gave a man an indignation at himself and all others. It was a very sensible humiliation to me, and, for some time after I heard him, I could not bear the thought of my own performances, and was out of countenance when I was forced to think of preaching. His style was rather too fine; but there was a majesty and beauty in it that left so deep an impression, that I cannot yet forget the sermons I heard him preach thirty years ago. And yet with this he seemed to look on himself as so ordinary a preacher, that while he had a cure, he was ready to employ all others, and when he was a bishop, he chose to preach to small auditories, and would never give notice beforehand: he had indeed a very low voice, and could not be heard by a great crowd."[2]

The leading clergy of that period were men of fervent zeal, and several of them possessed no mean share of learning; but in various instances the heat of their zeal seems to have dried up the sources of their Christian charity; nor did they think it lawful, not to say expedient, to tolerate any differences of religious opinion. The sinfulness of toleration was a topic too frequently inculcated. It must at the same time be recollected that there was no existing church from which the principles of toleration could then be learned. The bishop proceeds to state that Leighton "soon came to see into the follies of the presbyterians, and to dislike their covenant; particularly the imposing it, and their fury against all who differed from them. He found they were not capable of large thoughts: theirs were narrow, as their tempers were sour. So he grew weary with mixing with them. He scarce ever went to their meetings, and lived in great retirement, minding only the care of his own parish at Newbottle near Edenborough. Yet all the opposition that he made to them was, that he preached up a more exact rule of life than seemed to them consistent with human nature: but his own practice did even outshine his doctrine." Let it in the mean time be remembered that the follies of the episcopalians were at least equally conspicuous, and that they took a more bloody direction. The presbyterians did not let loose a ferocious band of ruffians to cut the throats of men and women, if they merely refused to pray as they were directed.

In the year 1648 Leighton declared in favour of the engagement for the king, and thus exposed himself to the hazard of being subjected to heavy penalties. When some of his parishioners who had been concerned in the unfortunate expedition to England, were enjoined to make a public profession of their repentance, he studiously avoided all mention of the grounds of the war, but admonished them that "they had been in an expedition, in which, he believed, they had neglected their duty to God, and had been guilty of injustice and violence, of drunkenness, and other immoralities, and he charged them to repent of these very seriously." The earl of Lothian, who resided in his parish, and entertained a high esteem for his character, had sufficient influence to protect him from any serious annoyance. It is however evident that he found himself placed in a very uncomfortable situation; and his uneasiness must in no small degree have been encreased by the differences which unhappily ensued between the resolutioners and protesters. He was at length induced to resign the pastoral charge of Newbattle. This resignation took place in the year 1652; and, under the date of May 24, 1653, we find the subsequent record of a conversation with Brodie, one of the judges. "I spoke with Mr Leighton. He did shew me that the composing of our differences was not a harder task than the finding out the Lord's mind by them, both the procuring and final cause. He thought holiness, the love of God and our brethren, was the chief duty God was calling us unto, and sobriety and forbearance to one another. He knew not if it were not from his natural temper, or something of the English air; but he thought it was the safest to incline *in mitiorem partem*. Much persecution was there upon our imposing upon one another, as if we were infallible, allowing none that differed from ourselves in the least measure. He thought the Lord would break that which we would so fain hold up, our judicatories: he had observed so much of our own spirit in them these many years past, that he had lothed them for the most part, and wearied of them."[3]

The office of principal of the university of Edinburgh became vacant by the death of John Adamson in the year 1652. He was a man of learning and reputation, nor did the electors fail to look for a worthy successor. Their first choice fell upon William Colville, minister of the English church at Utrecht; but some difficulties, whether political or ecclesiastical, having been interposed, Leighton was elected on the 17th of January 1653, and was persuaded to accept of an office for which he was so eminently qualified by his character, his talents, and his attainments. With the office of principal is conjoined that of primarius professor of divinity. The other professor of divinity was David Dickson, who published several theological works, and was a man of high consideration with his own party. Some of Dr Leighton's academical prelections, as well as his addresses to the students, have been preserved, and they exhibit the author in the most favourable light. He continued several years in that post, says Burnet, "and was a great blessing in it; for he talked so to all the youth of any capacity or distinction, that it had great effect on many of them. He preached often to them; and if crowds broke in, which they were apt to do, he would have gone on in his sermon in Latin, with a purity and life that charmed all who understood it. Thus he had lived above twenty years in Scotland, in the highest reputation that any man in my time ever had in that kingdom."

During the vacations, he made occasional excursions to

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[1] Scotish Pasquils, b. iii. p. 88. It is here stated that he was *extruded* from the college for writing this epigram; but if the statement is correct, he must speedily have been re-admitted. Among Wodrow's MSS. in the Advocates Library (Rob. III. 6. 14.), a copy of the epigram is followed by an *Apologie* of twenty-four lines, ascribed to "Mr R. Lightoune."

[2] Burnet's History of his own Time, vol. i. p. 230. Oxford, 1823, 6 vols. 8vo. This is the first genuine edition of the book.

[3] Diary of Alexander Brodie of Brodie, Esq. p. 50. Edinb. 1740, 8vo.

England, and even to Flanders. He had an opportunity of observing the character of the eminent men who frequented the protector's court; but, according to the account which he gave to his friend, "he could never see any thing among them that pleased him. They were men of unquiet and meddling tempers; and their discourses and sermons were dry and unsavoury, full of airy cant, or of bombastic swellings. Sometimes he went over to Flanders, to see what he could find in the several orders of the church of Rome. There he found some of Jansenius's followers, who seemed to be men of extraordinary tempers, and studied to bring things, if possible, to the purity and simplicity of the primitive ages; on which all his thoughts were much set." The restoration of a heartless and profligate monarch, who had derived no wisdom from experience, introduced a material and fatal change in the state of ecclesiastical affairs in Scotland. The great body of the people were firmly and zealously attached to the presbyterian polity and form of worship, which Charles had solemnly promised to maintain: but episcopacy was considered as more favourable to those maxims of government which he and some of his councillors were inclined to propose; and the resolution, equally iniquitous and impolitic, was finally adopted of forcing upon his northern subjects an ecclesiastical establishment, which the most honest and devout portion of them regarded as but one small degree removed from popery. The undaunted opposition to the innovations of the late unfortunate reign, seems to have been utterly erased from the memory of those who now devised the restoration of episcopacy in Scotland. It was doubtless thought a wise and dexterous measure to place at the head of this new establishment a very conspicuous proselyte from the presbyterian cause, James Sharp, who had recently been appointed professor of divinity at St Andrews,[1] and who had been sent to London as the accredited agent of the Scotish clergy. He was a person of address and of talents for business; but being at the same time aspiring and unscrupulous, he could not resist the temptation which was now presented to him; and in an evil hour he entered upon a career of ambition which he pursued with great violence, and which was at length brought to a very tragical termination. Sharp was nominated to the archbishopric of St Andrews, Fairfowl to that of Glasgow; Sydserf, who had been bishop of Brechin and Galloway, and who was the sole survivor of the ancient bench, to the see of Orkney; and Hamilton, a brother of Lord Belhaven, to that of Galloway. Leighton, who was then in London, on his return from Bath, where he had been residing for the benefit of his health, was persuaded to accept of a bishopric, and he selected that of Dunblane, a small diocese, as well as a small revenue. He had previously cultivated an acquaintance with several episcopalians, and, among others, with the father of Bishop Burnet. He was a man of so much primitive piety, and was so uncontaminated with worldly ambition, that no person of ordinary candour can impute his change to any unworthy motive. He evidently considered church government as a matter not determined by any positive injunctions, but open to the adjustment of bodies of men varying in their opinions, and placed in a variety of circumstances. In the mere name of a bishop there is nothing pernicious; but that the office may be rendered highly pernicious, the history of the church has too clearly evinced. According to Dr Paley, "the appointment of various orders in the church, may be considered as the stationing of ministers of religion in the various ranks of civil life. The distinctions of the clergy ought, in some measure, to correspond with the distinctions of lay-society, in order to supply each class of the people with a clergy of their own level and description, with whom they may live and associate upon terms of equality."[2] In conformity with this evangelical distribution of rank and office, the English curate is reduced to the condition of the labouring poor, and the archbishop is raised to the level of the first nobility. All this is frequently described as very apostolical: but we are not aware that the apostles recommended their successors to a seat in the house of lords; nor have they clearly taught us to infer that the prosperity of the church of Christ has any necessary connexion with such splendour. We recollect the appropriate remark of a writer eminently distinguished by his acuteness and candour of mind. "Exorbitant wealth annexed to offices," says Dr Campbell, "may be said universally to produce two effects. These two effects are, arrogance and laziness." And on this subject what were the sentiments of Dr Leighton? "It is true," he remarks, "that penury and want of competency in temporals, in those who bring an eternal treasure, argues base ingratitude, and is most unworthy of well-constituted churches. But where the remedy exceeds too far, it becomes worse than the disease, being compounded of carnal prudence and ambition, both of which are enmity to God." Ecclesiastics raised to great and superfluous wealth, may in some instances be fully as much inclined to imitate the folly as to improve the piety of their fashionable associates. We are very far from wishing to reduce the order to a primitive state of poverty; but we are not prepared to acquiesce in the opinion, that the personal respectability, or the spiritual influence, of a clergyman, is more effectually secured by five thousand than by five hundred pounds a year.

The nomination of the other bishops was chiefly left to Dr Sharp; but the promotion of Dr Leighton, who was not such a person as he would have been inclined to select, was solely imputed to his brother Sir Ellis Leighton, who was at that period secretary to the duke of York. In his face, as well as in the vivacity of his talents, he resembled the bishop of Dunblane, but in other respects no two individuals could be more unlike each other. The knight was as unprincipled as the other courtiers of that time and place. In order to favour his schemes of ambition, he had embraced the Romish faith, and the general tenor of his conduct exhibited a great laxity of moral feeling. But, in such a foul atmosphere, who could be free from contamination? He was intimately acquainted with Lord Aubigny, a brother of the duke of Richmond's, who had not only changed his religion, but had even entered into holy orders. It was perhaps one recommendation to the king's favour, that he led a very vicious life; and as he was in the secret of his majesty's religion, and was acquainted with his private schemes for the advancement of popery, he enjoyed an ample share of his confidence. Sir Ellis impressed this nobleman with a very high opinion of his brother's qualifications: he did not overlook his celibacy and his ascetic mode of life, as being conformable to the popish notions of piety; nor did he scruple to aver, what was very remote from the truth, that he was persuaded of his being secretly inclined to their own faith. Through this polluted channel did the learned and pious Leighton arrive at his high station in the church; for at the suggestion of Aubigny, the king nominated him to a bishopric, and thus excited the suspicion of Sharp, who did not wish for a coadjutor of his spiritual habits and superior character. It was not without the utmost reluctance that he was induced to accept of this preferment. Of the four bishops-elect, only two had received episcopal ordination; but before the consecration of the other two, Sharp and Leighton, it was considered as absolutely necessary to ordain them deacons and priests. The same necessity was not recognized at the consecration of Scotish bishops in the year 1610; for when Bishop Andrews maintained that they must first be ordained presbyters, as having received no episcopal ordination, Archbishop Bancroft replied that "there was no necessity, seeing where bishops could not be had, the ordination given by the presbyters must be esteemed lawful; otherwise that it might be doubted if there were any lawful vocation in most of the reformed churches."[1] Wycliffe had adopted the opinion of St Jerom, that in the age of the apostles,[2] presbyter and bishop were names of the same office-bearers. This opinion was likewise maintained by the founders of the English reformation; and Cranmer has unequivocally stated that "a bishop may make a priest by the Scriptures, and so may princes and governors alsoe, and that by the auctority of God committed to them, and the people alsoe by their election." Archbishop Whitgift declares that no form of government is by the Scriptures prescribed to the church of God; and the mutability of ecclesiastical government is asserted by Hooker, and other distinguished writers of that period. This indeed appears to have been a prevalent opinion, till the pontificate of the unhappy Laud, who was but too anxious to complete the assimilation of the English with the Romish hierarchy, and whose mind was deeply tinctured with the most abject superstition. The divine right of episcopacy was not however maintained by some of the most eminent divines of the succeeding age. Bishop Stillingfleet, in a very learned and able work,[3] has completely demonstrated that bishop and presbyter were originally different appellations of the same office-bearers; that the apostles have nowhere enjoined any particular form of ecclesiastical polity; and that "a mere apostolical practice being supposed, is not sufficient of itself for the founding an unalterable and perpetual right for that form of government in the church, which is supposed to be founded on that practice." And as to what is called the perpetual succession in the church,[4] he has distinctly averred, that "this personal succession, so much spoken of, is sometimes attributed to presbyters, even after the distinction came into use between bishops and them."—To this idle or arrogant ceremony of reordination, Sharp, who "had swallowed down greater matters," submitted with no small reluctance; but, as Dr Mitchell has remarked, "Leighton submitted easily to this, not because he was eager to put on a mitre, but because he had good sense enough, and a sufficient acquaintance with Scripture, and the writings of early antiquity, to know that it was a matter of no consequence, whether he submitted to it or not." These two were privately ordained deacons and priests; and on the 15th of December 1661, all the four were publicly consecrated in Westminster Abbey. The good bishop of Dunblane was scandalized at the feasting and jollity which followed this religious ceremony. They travelled towards Scotland in one coach; and Leighton stated to Burnet that he believed his associates were weary of him, for he was very weary of them. When he found that they intended to enter the metropolis with some degree of pomp, he left them at Morpeth, and reached Edinburgh a few days before them. The other bishops made a kind of triumphal entry; the lord chancellor, with the nobility and privy counsellors, as well as the city magistrates, having joined in a procession, and met them in due form. Soon after their arrival, other six bishops were consecrated; but they were not subjected to the previous ceremonial of being ordained deacons and priests. Parliament assembled in the month of April 1662, and most of the bishops immediately took their seats: Leighton did not however appear among them, and he adhered to the practice of only attending in his place when he expected some discussion concerning religion or the church. He did not permit his friends to give him the title of lord, nor did he willingly acquiesce in its being given to him by others; for he evidently had not unlearned the presbyterian lesson, that Christ has no lords in his house.

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[1] Symson's Account of the Life of Dr James Sharp, Arch-bishop of St Andrews, p. 42. *Printed in the year* 1723, 8vo.

[2] Paley's Sermons and Tracts, p. 92. Lond. 1815, 8vo.

He speedily found that his new associates were for the most part men from whom the cause of religion could derive very slender aid, and that the affairs of the church were managed with as little wisdom as moderation. Sharp, though a man of talents, was artful and insincere. Of the other prelates, very few were eminently distinguished by either learning or piety, and the parochial clergy were in all respects greatly inferior to those whom they had supplanted. "By these means," says Bishop Burnet, "Leightoun quickly lost all heart and hope; and said often to me upon it, that in the whole progress of that affair there appeared such cross characters of an angry providence, that, how fully soever he was satisfied in his own mind as to episcopacy itself, yet it seemed that God was against them, and that they were not like to be the men that should build up his church; so that the struggling against it seemed to him like a fighting against God. He who had the greatest hand in it proceeded with so much dissimulation; and the rest of the order were so mean and selfish; and the earl of Middleton, with the other secular men that conducted it, were so openly impious and vicious, that it did cast a reproach on every thing relating to religion, to see it managed by such instruments." He governed his own diocese like a truly Christian bishop, labouring very assiduously in his vocation, and uniformly pursuing measures of gentleness and conciliation. But the ecclesiastical, as well as the civil rulers, were generally inclined to pursue measures of so opposite a nature, that he at length adopted the resolution of resigning his bishopric. This resolution he announced to the clergy of Dunblane in the year 1665, and afterwards proceeded to London, for the purpose of communicating it to the king. He gave his majesty a true account of the proceedings in Scotland, "which, he said, were so violent, that he could not concur in the planting the Christian religion itself in such a manner, much less a form of government. He therefore begged leave to quit his bishopric, and to retire; for he thought he was in some sort accessory to the violences done by others, since he was one of them, and all was pretended to be done to establish them and their order." The king appeared to be somewhat moved at the good bishop's recital; and having spoken of the primate with severe reprehension, he promised to enforce a more lenient method of proceeding with the nonconformists. He thus prevailed upon Leighton to retain his bishopric; and he so far fulfilled his promise as to suspend the functions of the ecclesiastical commission. But most of his Scotish ministers were so utterly destitute of all principle and humanity, that no material improvements ensued. The presbyterians were subjected to such intolerable grievances, that at length, in the year 1666, they had recourse to arms, but their military proceedings were very speedily terminated at the battle of Pentland-hills. The atrocious murders committed among a conscientious and resolute people, were committed under the sanction of a king who had once professed the same religion with themselves, and who was now consigning them to the sword and halter, because they refused to adopt the rites of a church whose creed he had secretly renounced. If every other action of his life had been free from reproach, this cold-blooded and unrelenting villany would alone have been sufficient to ensure the execration of all posterity. What a lamentable picture of human depravity was exhibited in the two monarchs of Britain and France; men immersed in the most debasing sensuality, surrounded by the most profligate of both sexes, and, from the polluted atmosphere in which they daily breathed, sending forth mandates to their subjects to shape their religious creed and ritual according to the pattern which their majesties were graciously pleased to prescribe. To this point, the matter only seems capable of exciting derision; but a very different sentiment arises in the mind when we recollect that both Charles and Louis were prepared to carry havoc and devastation where other means of conversion had been found ineffectual. In the French king there might be a certain species of consistency when he cut the throats of his protestant subjects, because they refused to embrace popery: but in the English king there was manifestly none when he cut the throats of his presbyterian subjects, because they refused to embrace episcopacy; unless we can discover some consistency in the mere consideration, that those converted to episcopacy were brought one step nearer to his own faith.

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[1] Spotswood's History of the Church of Scotland, p. 514.

[2] See Dr Campbell's Lectures on Ecclesiastical History, vol. i. p. 125.

[3] Stillingfleet's *Irenicum*, a Weapon-salve for the Churches Wounds, second edition. Lond. 1662, 4to.

[4] See Dr Mitchell's Presbyterian Letters, p. 185. Lond. 1809, 8vo.

In the midst of these direful scenes of persecution, the gentle spirit of Leighton must have been heavily afflicted. He opposed all the violent methods of producing a formal compliance with the established mode of worship; and to the nonconformists of his own diocese he granted a liberty of conscience which the laws of those flagitious times did not acknowledge. Not satisfied with this limited indulgence, he made great exertions to secure a more general and permanent toleration. With this view he repaired to court in the year 1669, and had two audiences of the king. One of those who seconded his endeavours was Dr Wilkins, bishop of Chester. The king at length addressed a letter to the privy council, commanding them to indulge such of the presbyterian clergy as were peaceable and loyal, so far as to suffer them to serve in vacant churches, though they did not submit to the present establishment. But this indulgence was not attended with any beneficial effects: the presbyterians and episcopalians were alike dissatisfied, and the country long continued in a state of the most unhappy agitation. It was violently opposed by the clergy of the diocese of Glasgow; and the archbishop, Dr Alexander Burnet, gave so much offence to Lauderdale by his zeal against it, that he found it expedient to retire to a private station, with the provision of an annual pension. It was not without much reluctance that Leighton was induced to accept of the vacant office. As his translation was attended with some informalities, he became, according to the strictness of the ecclesiastical law, not archbishop, but administrator of the archbishopric.[1] He removed to Glasgow in 1670, and in the course of the preceding year his friend Dr Gilbert Burnet had been elected professor of divinity in that university. They appear to have lived upon terms of great cordiality; and to Burnet, who became bishop of Salisbury, we are indebted for a copious and most interesting record of his evangelical virtues.

Soon after his translation, he held a synod of his clergy, who uttered many complaints of being deserted and ill-treated by the people. In his public and private discourses, he exhorted them to consider themselves as ministers of the cross of Christ, to lay aside all desire of revenge, and to humble themselves before God. "This was a new strain to the clergy. They had nothing to say against it; but it was a comfortless doctrine to them, and they had not been accustomed to it. No speedy ways were proposed for forcing the people to come to church, nor for sending soldiers among them, or raising the fines to which they were liable. So they went home, as little edified with their new bishop as he was with them." Accompanied by the professor of divinity, he afterwards visited some of the most eminent of the indulged ministers in different districts, with the view of persuading them to listen to terms of accommodation. Although his overtures were but coldly received, he was unwilling to abandon all hope of conciliation. In the presence of the earls of Lauderdale, Rothes, Tweeddale, and Kincardine, he held a conference at Edinburgh with six of the presbyterian clergy. He spoke for nearly half an hour, with much gravity and force, but his arguments in favour of episcopacy produced no effect upon those to whom they were addressed, nor was a second conference attended with a different result. He sent to the western counties six episcopal clergymen, Burnet, Charteris, Nairne, Aird, Cook, and Paterson, who were commissioned to preach in vacant churches, and to argue with the people on the grounds of conformity and accommodation. "The people of the country," says Burnet, "came generally to hear us, though not in great crowds. We were indeed amazed to see a poor commonalty so capable to argue upon points of government, and on the bounds to be set to the power of princes in matters of religion: upon all these topics they had texts of Scripture at hand; and were ready with their answers to any thing that was said to them. This measure of knowledge was spread even among the meanest of them, their cottagers, and their servants. They were indeed vain of their knowledge, much conceited of themselves, and were full of a most entangled scrupulosity; so that they found, or made, difficulties in everything that could be laid before them. We staid about three months in the country; and in that time there was a stand in the frequency of conventicles." Against these conventicles two acts had recently been passed. In reference to one of them, Leighton declared to the earl of Tweeddale, that the entire tenor of it was so contrary to the common rules of humanity, not to say Christianity, that he was ashamed to participate in the councils of those who could frame and pass such laws. Nor must it be forgotten that these atrocious laws were not suffered to continue a dead letter. At Paisley the archbishop had another meeting with the presbyterians, to the number of about thirty; and their conferences came to a final close in the month of January 1671, when, at a meeting in the earl of Rothes's house in Edinburgh, Hutcheson declared, in the name of his party, that "they had considered the propositions made to them, but were not satisfied in their consciences to accept of them."

In the course of one year, four bishoprics became vacant, and the choice of them was offered to Dr Burnet. Leighton was authorized to recommend such individuals as he thought most worthy of promotion; but neither Burnet, Charteris, nor Nairne, could be induced to undertake the episcopal office in the church, as it was then constituted; and as they were among the most learned and respectable of the episcopal clergy, he thus found himself beset with new discouragements. He had failed in his endeavours to conciliate the presbyterians, and was suspected and hated by the episcopalians. In utter despair of securing any benefit to others or satisfaction to himself, he adopted the resolution of resigning his preferment, and retiring from all public employment. He accordingly repaired to London in 1672, and, not without considerable difficulty, obtained the king's permission to resign after an interval of one year. He however retained the archbishopric till the year 1674, and Alexander Burnet was then restored to his former dignity. Leighton now returned to Edinburgh, and for some time lived within the precincts of the university; where the chair which he had occupied was not unworthily filled by William Colville, who had been put in nomination at the time of his own election. He afterwards retired to England, and spent the remainder of his life with his sister Sapphira, the wife and finally the widow of Mr Lightwater of Broadhurst, a demesne in the parish of Horsted Keynes and county of Sussex. He had another sister married to a Mr Rathband, of whom we find no further mention. His time was chiefly spent in devout seclusion, but he frequently officiated in the parish church, and in some others of that vicinity. In the year 1679, an attempt was made to draw him from his retreat: at the suggestion of the duke of Monmouth, the king was induced to request that he would again fix his residence in Scotland, and use his endeavours in reconciling the ecclesiastical animosities which still prevailed in that country. "I desire you may go down to Scotland with your first conveniency, and take all possible pains for persuading all you can, of both opinions, to as much mutual correspondence and concord as may be; and send me, from time to time, characters both of men and things. In order to this design, I shall send you a precept for two hundred pounds sterling upon my exchequer, till you resolve to serve me in a stated employment." But the duke soon afterwards ceased to have any influence in the affairs of either kingdom, and this negociation seems to have made no further progress.

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[1] Keith's Catalogue of the Scottish Bishops, p. 267. Russell's edit. Pref. to Symson's Life of Sharp, p. xlviii.

In the year 1684 Leighton was urged by Dr Burnet to make a journey to London, for the purpose of meeting the earl of Perth, chancellor of Scotland, who had expressed an earnest wish to see him; and his friend entertained a hope that this "angelical man might have awakened in him some of those good principles which he seemed once to have, and which were now totally extinguished in him." When he reached the metropolis, Burnet was surprised to see him look so fresh and active at his advanced period of life: his hair was still black, and he retained much of his former vivacity, with the same quickness of conception and strength of memory. He however spoke of his work and journey being nearly finished at the same time: he was next day seized with a pleurisy; on that which ensued, he suddenly fell into a state of insensibility, which continued for about twelve hours, and he then expired without pangs or convulsions. He was constantly attended by that friend whose zeal had prevailed upon him to undertake this fatal journey. He died on the 25th of June 1684, in the seventy-fourth year of his age, ten years after he had ceased to be archbishop of Glasgow. He closed his earthly pilgrimage at an inn in Warwick-lane, and his remains were deposited at Horsted Keynes. A great portion of his income had been devoted to deeds of charity and benevolence; and by a will, dated on the 17th of February, he had destined the residue of his property to charitable uses.[1] To his sister, and to her son Edward Lightwater of Broadhurst, he only left a small token of grateful acknowledgement of the great kindness with which they had treated him while he was their guest. His library he bequeathed to the cathedral of Dunblane, for the use of the clergy of that diocese; and although the fashion of a cathedral and diocese has there passed away, the library is still preserved in the same place.

The character of Leighton has been drawn by Bishop Burnet in very striking colours. "He had great quickness of parts, a lively apprehension, with a charming vivacity of thought and expression. He had the greatest command of the purest Latin that ever I knew in any man. He was a master both of Greek and Hebrew, and of the whole compass of theological learning, chiefly in the study of the Scriptures. But that which exalted all the rest was, he was possessed with the highest and noblest sense of divine things that I ever saw in any man. He had no regard to his person, unless it was to mortify it by a constant low diet, that was like a perpetual fast. He had a contempt both of wealth and reputation. He seemed to have the lowest thoughts of himself possible, and to desire that all other persons should think as meanly of him as he did himself: he bore all sorts of ill usage and reproach, like a man that took pleasure in it. He had so subdued the natural heat of his temper, that in a great variety of accidents, and in a course of twenty-two years' intimate conversation with him, I never observed the least sign of passion, but upon one single occasion. He brought himself into so composed a gravity, that I never saw him laugh, and but seldom smile. And he kept himself in such a constant recollection, that I do not remember that ever I heard him say one idle word. There was a visible tendency in all he said to raise his own mind, and those he conversed with, to serious reflections. He seemed to be in a perpetual meditation. And, though the whole course of his life was strict and ascetical, yet he had nothing of the sourness of temper that generally possesses men of that sort."[2] In another work, he mentions the archbishop in terms of similar commendation. "I have now laid together with great simplicity what has been the chief subject of my thoughts for above thirty years. I was formed to them by a bishop that had the greatest elevation of soul, the largest compass of knowledge, the most mortified and most heavenly disposition, that I ever yet saw in mortal; that had the greatest parts as well as virtues, with the perfectest humility that I ever saw in man; and had a sublime strain of preaching, with so grave a gesture, and with such a majesty both of thought, of language, of pronunciation, that I never once saw a wandering eye where he preached, and have seen whole assemblies often melt in tears before him; and of whom I can say with great truth, that in a free and frequent conversation with him for above two and twenty years, I never knew him say an idle word, that had not a direct tendency to edification: and I never once saw him in any other temper but that which I wished to be in, in the last minutes of my life. For that pattern which I saw in him, and for that conversation which I had with him, I know how much I have to answer to God: and though my reflecting on that which I knew in him, gives me just cause of being deeply humbled in my self, and before God, yet I feel no more sensible pleasure in any thing, than in going over in my thoughts all that I saw and observed in him."[3]

Of his indifference to literary reputation we have a sufficient proof in the fact of his never having committed any of his works to the press. For their preservation we are chiefly indebted to James Fall, D.D. who had been principal of the university of Glasgow, and, having vacated his office at the Revolution, was collated to the precentorship of the cathedral of York.[4] The first of these posthumous works is a volume of "Sermons; published at the desire of his friends after his death, from his papers written with his own hand." Lond. 1692, 8vo. This was followed by his "Prælectiones Theologicæ, in Auditorio Publico Academiæ Edinburgenæ (dum Professoris Primarii munere ibi fungeretur) habitæ: una cum Paræenesibus in Comitiis Academicis ad Gradus Magistralis in Artibus Candidatos. Quibus adjiciuntur Meditationes ethico-criticæ in Psalmos iv. xxxii. cxxx. Ex Authoris autographo fideliter editæ." Lond. 1693, 4to. Of a very recent date, there is a more correct edition, published under the title of "Roberti Leighton, S. T. P. Archiepiscopi Glasgnensis, Prælectiones Theologicæ; Paræneses; et Meditationes in Psalmos iv. xxxii. cxxx. ethico-criticæ. Editio nova, recensente Jacobo Scholefield, A.M. R.S.L.S. Græcarum Literarum apud Cantabrigienses Professore Regio, et Collegii SS. Trinitatis nuper Socio." Cantabrigiæ, 1828, 8vo. An English translation of the prelections and exhortations had been published with the title of "Theological Lectures, read in the Publick Hall of the University of Edinburgh; together with Exhortations to the Candidates for the Degree of Master of Arts: translated from the original Latin." Lond. 1763, 8vo. Mr Pearson is evidently mistaken in supposing that these compositions had been translated by Dr Fall. The *Meditationes* were translated under the inspection of Dr Doddridge, and inserted in his edition of the author's works. Dr Fall next edited "A practical Commentary upon the first Epistle General of St Peter." York and Lond. 1693–4, 2 vols. 4to. The first volume was printed at York, and the second at London. "Perhaps," says the late Mr Orme, "there is no expository work in the English language equal altogether to the exposition of Peter. It is rich in evangelical sentiment and exalted devotion. The meaning is seldom missed, and often admirably illustrated. There is learning without its parade, theology divested of systematic stiffness, and eloquence in a beautiful flow of unaffected language and appropriate imagery."[1] These original editions are most incorrectly printed. The commentary was followed by "An Exposition of the Creed, Lord's Prayer, and ten Commandments; with two Discourses, on St Matth. xxii. 37, 38, 39, and Heb. viii. 10; to which is annext a short Catechism." Lond. 1701, 8vo. The volume contains a portrait of the author, engraved by R. White. Of his works edited by Dr Fall, the last is a small collection of Tracts. Lond. 1708, 12mo. It includes the Rules for a Holy Life, a Sermon, and the Catechism. After a considerable interval appeared "Select Works of Archbishop Leighton, some of which were never before printed. To which is prefixed an account of the author's life and character." Edinb. 1746, 8vo. This publication was soon followed by "The Expository Works and other Remains of Archbishop Leighton, some of which were never before printed. Revised by P. Doddridge, D.D. with a preface by the doctor." Edinb. 1748, 2 vols. 8vo. There are many other editions of a subsequent date, but among these we shall only specify that of Lond. 1825, 4 vols. 8vo. To this collective edition, which has been more than once reprinted, the Rev. John Norman Pearson has prefixed a copious life of the author, and has made some important additions to the old stock of biographical materials. (x.)

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[1] Pearson's Life of Leighton, p. clxxiv. edit. 1830.

[2] Burnet's History of his own Time, vol. i. p. 228.

[3] Burnet's Discourse of the Pastoral Care, p. 220. 4th edit. Lond. 1736, 8vo. See likewise the preface to his Life of Bedell.

[4] Diary of Ralph Thoresby, F.R.S. vol. i. p. 365. He afterwards mentions that he "visited the excellent Dr Fall at the duke of Queensberry's in London." (Vol. ii. p. 24.) Professor Scholefield apparently considered him as some very obscure person: "edente quodam Jacobo Fall."

LEIGHTON BUZZARD, or BEAUDESERT, a market-town of the hundred of Manshead, in the county of Bedford, forty-one miles from London. It is situated on a branch of the river Ouse, and has a good market-place, with a cross in the centre. The only trade is some lace-making, and some plaiting of straw. There is a good market, which is held on Tuesday. The population of the town amounted in 1801 to 1963, in 1811 to 2114, in 1821 to 2749, and in 1831 to 3330, but the whole parish at the last census contained 5149 inhabitants.

LEINSTER, the eastern province of Ireland, bounded by Ulster on the north; by St George's, or the Irish Channel, on the east and south; and by the provinces of Connaught and Munster on the west. The capital city of this province and of the kingdom is Dublin. It contains twelve counties, viz. Carlow, Dublin, Kildare, Kilkenny, King's County, Longford, Louth, Meath, Queen's County, West Meath, Wexford, and Wicklow.

LEIPA, a city of the circle of Leutmeritz, in the Austrian kingdom of Bohemia. It stands on the river Polzen, and has a gymnasium, 688 houses, and 4918 inhabitants. It is a manufacturing place, producing linen and woollen cloths, glass, and earthenware.

LEIPZIG, one of the circles into which the kingdom of Saxony is divided. It extends over 1195 square miles, comprehends twenty-three cities and towns, with 794 villages, and contains 216,564 inhabitants. It consists of two parts, Leipzig and Wurzen, which are again subdivided into bailiwicks. The city of the same name is the capital. It is situated on the river Pleisse; is surrounded with walls, which are useless for any defensive purpose; and contains a population, including the garrison and the university, of 38,000 persons. The university is more remarkable for its learning than for the number of its students, but it has a good library, observatory, anatomical theatre, and other establishments for professional education. There are one Catholic, one Reformed, and eight Lutheran churches. Some of the streets are narrow, but the houses are large, and the market-place is a fine square. It is a place abounding in manufactures of various kinds; but few of them are on an extensive scale, and most of them for articles of convenience and luxury. It has a prosperous trade, chiefly arising from its two great fairs, which are resorted to by producers and consumers from all parts of Germany, many of the former being from England, France, the Netherlands, and Switzerland. It is the great emporium of German literature, where books, at whatever place printed, are commonly published. It has been the scene of battles in 1631 and in 1646, and especially in October 1813, when the fate of the French empire was decided in what the Germans have called "the battle of nations." Long. 12. 16. 31. E. Lat. 51. 20. 24. N.

LEITH, a populous sea-port town in the county of Edinburgh, situated on the southern shore of the Frith of Forth, at the mouth of the Water of Leith, and distant about a mile and a half from the centre of the Scottish capital. The ancient name of the town, which is of considerable antiquity, having been for several centuries not only the first, but almost the only port in Scotland, was Inverleith, a compound word of Gaelic origin, *inver* signifying in that language the mouth of a river, and being thus descriptive of the situation of the port.

Although there are traces of the existence of Leith in ancient documents as far back as the twelfth century, yet little is certainly known regarding it until the fourteenth, when it had acquired such importance, and begun to hold out such prospects of commercial benefit, as to attract the notice and excite the cupidity of the magistrates and citizens of Edinburgh, who, with the view of availing themselves of the advantages it offered for maritime adventure and speculation, obtained a grant of its harbour and mills from King Robert I. for the yearly payment of fifty-two merks. This right they subsequently extended so far as to secure almost the entire trade of the port, to the exclusion, and even ruin, of its inhabitants, by purchases at various times from Sir Robert Logan of Restalrig, who was proprietor and baronial lord of Leith; and finally completed its feudal subjection by purchasing the superiority of the town from Queen Mary, to whose mother, Mary of Lorraine, it had been sold by Logan, in the year 1565, for 10,000 merks. Even at this early period, the trade of Leith was considerable, at least comparatively so; and not a few names of celebrity in the ancient naval annals of Scotland are found associated with it. From these we may select that of the Bartons, famous as mariners in Scottish story.

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[1] Orme's Bibliotheca Biblica, p. 288. Edinb. 1824, 8vo.

Besides being a place of pretty high antiquity, Leith is also one of no small note in the history of Scotland, having been the scene of more military service perhaps than any other town in the kingdom. Neither has it been less remarkable for the frequency of its misfortunes. In 1313 all the vessels in the harbour were burned by the English, and again in 1410. In 1488 (an occasion, however, on which it suffered no injury) it was occupied by the forces commanded by the disaffected lords who had risen in arms against James III., after the defeat of the latter at Bannockburn. In 1544 it was plundered and burned, its pier destroyed, and its shipping carried off, by the Earl of Hertford, whom Henry VIII. had sent down by sea to Scotland, with an army of 10,000 men, to avenge the insult which he conceived the Scotch had offered him, by refusing to betroth their young queen, Mary, to his son Prince Edward. Three years subsequently to this, viz. in 1547, immediately after the battle of Pinkey, it was again plundered and burned by the English under Hertford, now Duke of Somerset, and protector of England. On this occasion, although the town itself did not suffer to the same extent as before, its whole shipping, together with all that in the Forth, was entirely annihilated by the English admiral, Lord Clinton, who co-operated with Hertford with a fleet of no less than thirty-five ships of war, besides tenders and other vessels. Four years after this, the town was fortified by Desse, a French general, who came over with 6000 men to assist the queen-regent in suppressing the Reformation. On the completion of these fortifications, which consisted in throwing a strong and high wall, with towers at intervals, around the town, the queen-regent took up her residence there, and, surrounded with her countrymen, hoped to be able to maintain her authority in the kingdom. These measures, however, had only the effect of widening the breach between her and her subjects, till they finally took up arms, and besieged her in her stronghold. In October 1559, the lords of the congregation, as the disaffected leaders called themselves, invested Leith with an army, but after various ineffectual attempts to gain access to the town by scaling the walls, they were driven back with great slaughter by a desperate sally of the besieged.

In the month of April in the succeeding year, the forces of the congregation again invested the town, being now aided by an army of 6000 men under Lord Grey of Wilton, which had been dispatched to their assistance by Elizabeth. On this occasion the contest was protracted and sanguinary, hundreds falling on both sides in the fierce assaults and sallies which were daily made by the besiegers and besieged respectively. For two months, during which the town suffered dreadfully from famine, as well as from the more violent casualties of war, the struggle continued, without any decisive advantage being gained by either side. At the end of that period, however, both parties being heartily tired of the contest, a treaty was entered into, by which it was stipulated that the French should evacuate the kingdom, that they should be allowed to embark unmolested, and that the English army should, upon the same day, begin its march to England. Immediately after the conclusion of this treaty, the walls of Leith were demolished by order of the town-council of Edinburgh, and no vestige of them now remains. The town, however, was temporarily re-fortified by the Earl of Morton during the regency of the Earl of Lennox, by whom it was constituted the head-quarters of the king's faction, and was thus once more involved in the miseries of war. Some new fortifications were shortly afterwards erected around it by the regent himself, who came to reside there, holding his court in the town, and making it the general rendezvous for the friends of his party.

In giving this chronological sketch of the most remarkable events which distinguish Leith, it would be a defect to omit noticing the landing, at that port, of the unfortunate Queen Mary, when she came from France to take possession of the throne of her ancestors. This event took place on the morning of the 20th of August 1561, between the hours of seven and eight o'clock. She landed upon the pier; but that pier has long since ceased to exist.

In 1643 the solemn league and covenant was signed by the inhabitants of Leith with great solemnity. Two years afterwards, the unhappy town was visited by the plague, by which it was nearly depopulated. Many melancholy memorials of this dreadful calamity have, up to a late period, been found in its vicinity; amongst these, quantities of half-decayed bones wrapped up in blankets, the remains of its unfortunate victims, for whom there was not room in the church-yard, nor time to provide them with the usual decencies of sepulture.

The next remarkable period in the annals of Leith is the year 1650, when it was taken possession of by Cromwell, and subjected to a monthly assessment of about L.22 sterling, besides the proportion of an exaction of L.2400 Scots, which was levied by the conqueror on Edinburgh and the vicinity, including Leith, immediately on his arrival. Upon Cromwell's return to England, General Monk, who was appointed commander-in-chief in Scotland, took up his residence in Leith, where he constructed a strong fort, and established a regular garrison. Some portions of this fort or citadel still remain, including the house in which Monk himself resided. The former was of a pentagonal shape, and consisted of five bastions, with one principal gate fronting the east. The expense of the whole was L.10,000 sterling. Whilst resident in Leith, Monk induced a number of respectable English families to come down and settle in the town. These introduced with their wealth a spirit of mercantile adventure, besides establishing certain branches of manufacture that greatly benefited the town, and laid the foundation of much of the prosperity which it has since enjoyed.

In 1715, the citadel was taken possession of by a party of the adherents of the Stuart family, headed by one Mackintosh of Borlum; but, being threatened by the Duke of Argyll, who was then in Edinburgh, with a strong military force, he evacuated the fort after dark, availing himself of low-water to march his men over the sands, upon which the citadel opened to the seaward; and with this event terminates the military history of Leith.

For a long period Leith was celebrated for its horse-races. These were held during the recess of the tide, on a large tract of sand lying on the east side of the town, and were first established at the Restoration. Though far inferior to a regular race-course, on account of the wetness of the sand, which rendered it exceedingly bad footing for the horses, these races were long celebrated with a spirit, and accompanied by a feeling of satisfaction and universal joy, which is rarely witnessed on similar occasions at other places. The race-week was, indeed, considered as a sort of carnival by the citizens of Edinburgh, which during its continuance was crowded by persons of rank and fashion from all parts of the kingdom. The races were removed, in 1816, to the Links of Musselburgh, a distance of about six miles, where the ground is much better adapted for this pastime.

Leith, though, as already stated, a pretty ancient town, has not many antiquities of a very marked character to boast of; modern improvement having swept them nearly all away. Amongst the few of any note that remain is the parish church of South Leith, a fine old Gothic edifice, though of comparatively but small dimensions. The precise date of the erection of this structure is not known; but it is certain that it was built previous to the year 1496. Of the ancient pier, the pier on which the ill-fated Mary landed in 1561, nothing now remains but a few blackened stumps, which have been seen protruding through the sand a little to the eastward of the present pier; but, from the frequent shifting of the former, they are rarely visible, and have now, we believe, disappeared altogether. Upon the south-east side of the town, on extensive downs, or, as they are called in Scotland, links, are several mounds, which were raised by the besieging army in 1560, and crowned with cannon. These are still entire, and, to all appearance, precisely in the same state in which they were left by those who constructed them. The only other piece of antiquity that remains to be noticed is the old church of North Leith. This ancient structure was founded in the year 1493, and was dedicated to St Ninian. It was long the parish church of North Leith, but has now been for many years disused for religious purposes. To these memorials of other times may be added a few private houses situated in the oldest parts of the town, which, though now, for the most part, in a dilapidated state, and inhabited by the poorest classes, bear evident marks of having been once of no small consideration. Amongst the ancient buildings of note that have disappeared may be mentioned, 1*st*, an ancient monastery, founded in 1435, and dedicated to St Anthony; its monks were of the order of St Augustin; the establishment, which was a very extensive and magnificent one, was situated at the head of the Kirkgate, but no trace of it remains, excepting some vaults, now included in the premises of a brewer. 2*d*, The King's Work, a building of great antiquity, and on good grounds believed to have been a royal residence; it was situated at the foot of Bernard Street, or rather between that street and the Broad Wynd; but all vestige of it has long since disappeared. 3*d*, The old Tolbooth was erected in 1565, and occupied the site of the present structure. 4*th*, Trinity-House, a very old building, stood where the modern house stands. *Lastly*, King James's Hospital; this edifice, now entirely removed, stood on the east side of the Kirkgate; it was founded by the church-session of South Leith in 1614, and endowed with certain lands and tenements belonging to the preceptory of St Anthony. Of the ancient pier, and of the walls and citadel, we have spoken elsewhere.

Leith is divided into the parishes of North and South Leith, the division being marked by the Water of Leith, which intersects the town. The greater and principal part of the latter, however, stands on the south side, where the chief business of the place is conducted. The town altogether may be about from one mile and a half to two miles in circumference; but, as it is in various places straggling and detached, it occupies more ground than would bear a fair proportion to its population. It is for the most part irregularly and confusedly built, and a great portion of it is extremely filthy, crowded, and inelegant. Some parts of it, again, are the reverse of this, being spacious, cleanly, and handsome. Such are two or three of the modern streets, and various ranges of private dwellings erected of late years on the eastern and western skirts of the town. Many of these, indeed, occupy situations and command views of so pleasant a character as to render them very desirable places of residence. The modern public buildings of Leith worthy of remark are, the Exchange Buildings, a large and elegant structure in the Grecian style of architecture; they contain a spacious and handsome assembly-room, a commodious hotel, and public reading-room, and the expense of the erection was L.16,000: the Custom-house, situated in North Leith, is also a very splendid building; it was erected in 1812, at an expense of L.12,000: the Leith Bank, a neat little edifice, erected in 1805–6: the new Court-house, by far the most elegant building in the town, and forming altogether, whether the chasteness of the design or the neatness of the workmanship be considered, a very favourable specimen of modern architecture on a small scale. The grammar school is a spacious building, of an oblong figure, in the Grecian style, erected in 1805–6.

Sea-field Baths.—These are situated at the distance of about half a mile from the town. They were erected in 1813, at an expense of L.8000, raised in shares of fifty guineas each. The building is large and handsome, and, besides the baths, contains a hotel; but it has not been a thriving speculation. The Trinity-House is another handsome though small edifice, in the Grecian style. It was erected in the year 1817, at an expense of L.2500. The Tolbooth is a new structure, in the Saxon style of architecture. It has several suits of well-lighted apartments; but, never having been legalized, is not used as a jail, the new court-house being employed for that purpose, although only as a place of temporary confinement, offenders against the laws being sent as soon as possible to Edinburgh. The Markets of Leith are both spacious and handsome. They were erected in 1819, and include a butcher-market, which is of an octangular form, surrounded with neatly-fitted up stalls, well lighted with gas; a fish-market; and poultry and vegetable markets.

The ecclesiastical statistics of Leith include the parish church of South Leith, which has been already spoken of. This charge is collegiate, one of the two ministers being appointed by the crown, the other by the magistrates and incorporated trades. It became the parochial place of worship in 1609, and was originally dedicated to St Mary. This parish has a chapel of ease of spacious dimensions. The parish church of North Leith is an exceedingly handsome though plain structure, surmounted by a lofty and tasteful spire. The stipend of the clergyman, who is appointed by the inhabitants, is reckoned one of the best in the Church of Scotland, and includes the tithe, now commuted into money, of all fish landed on the beach. To these fall to be added a neat though small English chapel, one Methodist, one Relief, one Independent, and three United Secession churches, capable altogether of containing, including the two parish churches and chapel of ease, upwards of 10,000 persons.

The charitable institutions of Leith are, a female society for relieving indigent and sick women; a society for relieving the destitute sick; the sympathetic society; a female school of industry; and a charity school for boys. To these may be added the Trinity-House, formed on the usual principles, for the relief of indigent or superannuated mariners.

The chief manufactures of Leith are ropes and cordage, sail-cloth, bottles, soap, and candles. Ship-building is also carried on there to a considerable extent. There are likewise several breweries, a distillery, and an extensive sugar-refining establishment. Crown-glass was also till lately manufactured there on a large scale; but not having been found a profitable speculation, it has been abandoned.

Hitherto we have treated of Leith merely as a town: we shall now proceed to consider it as a sea-port. For this it possesses no natural advantages; and the consequence has been a perpetual struggle, attended with enormous expense, to supply its deficiencies by works of art, and hitherto without by any means attaining fully either the objects aimed at, or a commensurate benefit for the outlay incurred.

The trade of Leith, as we have elsewhere said, has been considerable for several centuries past; but notwithstanding this, it was not till the year 1720 that any thing of importance was done for the improvement of its harbour. In that year a dock was formed on the east side of it, and that part of the present pier which is of stone erected. Fifty-seven years after this (for so long an interval occurred before any other improvement was attempted), a small quay, called the custom-house quay, was built; but these trifling accommodations being found wholly inadequate to the increasing demands of the port, the city of Edinburgh, in the year 1799, obtained an act of parliament authorizing them to borrow L.160,000, to enable them to form the present superb wet-docks designed by Mr John Rennie, civil engineer. These docks, of which there are two, were begun in the year 1800, and were completed in 1817. Each of them measures 250 yards in length and 100 in breadth, and both include a space equal to 10¼ English acres. On the northern side are three graving docks, each 136 feet long and forty-five wide at bottom, and 150 feet long by seventy feet wide at the top, with an entrance of the width of thirty-six feet. The whole of these works are protected from the sea by a strong retaining wall. At average spring tides the depth of water in the wet-docks is sixteen feet nine inches; and at average neap tides, twelve feet nine inches. They are lined on the south side by a row of lofty and spacious warehouses for bonding and storing foreign liquors and other goods.

The expense of these works amounted altogether to about L.285,000, of which L.265,000 was subsequently borrowed by the city of Edinburgh from government, at the rate of five per cent. interest, of which three per cent. was to be the rate of interest payable annually, and two per cent. to go to a sinking fund. This rate of interest, however, was, for certain considerations, reduced to four per cent. for twelve years. The security given by the city for this loan was a preferable claim on the whole of their Leith property, and a concurrent claim with other creditors over the entire property of the city of Edinburgh, besides ceding a part of the docks and shire-ground to the admiralty. Of this debt the sinking-fund cleared off about L.25,000, but subsequent arrears have left it nearly in its original state.

Since the improvements above mentioned were effected, another has taken place in the extension of the pier, and in the formation of a covering bulwark; the former at the expense (L.28,000) of the city of Edinburgh, the latter (L.12,000) at that of government. The addition which has been made to the length of the pier is 2550 feet, making it altogether upwards of half a mile in length. The object proposed by this extension, and the erection of the bulwark, was to increase the depth of water in the channel, an effect which it has had to the extent of about two feet.

It would appear, however, that the natural disadvantages of Leith are so great, and of so irremediable a character, that no ingenuity nor expense can ever wholly overcome them, or make it more than a mere tidal harbour, and even as that, but a very indifferent one. At present, notwithstanding all that has been done for it, it will not at any time admit of vessels of more than 400 tons, and not always of ships approaching that burthen; circumstances which, when added to its heavy charges, must always greatly limit its prosperity.

The collection of the revenues of the docks and harbour of Leith is in the hands of the corporation of Edinburgh, and the business of management is invested in a commission, formed by persons nominated both by Edinburgh and by Leith.

The general trade of the port has of late years been, upon the whole, rather on the decrease. In 1826 the tonnage belonging to Leith was 25,674 tons; in 1832, 23,094 tons; in 1835, 22,073 tons; thus showing a progressive decay. At one time it enjoyed nearly all the Baltic trade in the east of Scotland, but a great portion of this has now found its way to Kirkcaldy, Dundee, and Aberdeen. During the war, too, it was the principal naval station to which prizes were brought for condemnation; a source of benefit which it has likewise lost. Like many other towns also, it has suffered severely by foreign speculations; but, unlike some of these, it seems never to have entirely recovered from its misfortunes.

The opening of the Union Canal has likewise operated unfavourably for Leith, in as far, in particular, as regards its coal trade, of which it has deprived it of nearly one half. The quantity of this article formerly brought into Leith averaged about 57,000 tons annually. It does not at present much exceed 33,000. A branch railway, however, is now being introduced into Leith from Musselburgh and other places, which may have the effect of improving this department of its trade.

Leith enjoys a small West India trade, chiefly carried on by Glasgow merchants. This trade, again, is improving, and now employs shipping to the amount of 1768 tons, being an increase of upwards of 1000 tons within the last ten years. At some previous periods, however, it has employed an amount nearly equal to the former.

The coasting trade of Leith is still pretty extensive, and its foreign trade, particularly with the north of Europe, considerable. The chief imports in the latter are cheese, bark, hides, tallow, timber, rags, and flax. Large quantities of wine and tobacco are also imported into Leith.

The following tables will give a correct idea of the amount of the trade of the port, with its fluctuations; in the one case, during the last ten years; in the other, during three parts of a century.

Account of Dues levied on Shipping and Goods at Leith from 1825 *to* 1835, *both inclusive.*

Years.	On Vessels.			On Goods Imported.			On Goods Exported.			Total Amount.		
	L.	*s.*	*d.*	*L.*	*s.*	*d.*	*L.*	*s.*	*d.*	*L.*	*s.*	*d.*
1825	8941	18	2	11,277	14	5	965	16	6	21,185	9	1
1826	9908	17	3	9,661	3	9	962	13	4	20,532	14	4
1827	8461	3	10	9,070	9	2½	930	0	5	18,461	13	5½
1828	7690	11	3½	8,258	9	8	971	4	2	16,920	5	1½
1829	8302	2	9	8,852	10	0	1048	3	2	18,202	15	11
1830	9506	4	11	8,432	19	5	1018	15	4	18,957	19	8
1831	9749	17	8½	8,845	8	6½	1096	6	9	19,691	13	0
1832	9061	15	11½	8,072	16	8	1204	17	8	18,339	10	3½
1833	9104	9	7	7,632	3	0	1365	4	7	18,101	17	2
1834	9626	9	7	8,569	19	6½	1353	14	1	19,550	3	2½
1835	9254	5	2	7,898	16	2½	1402	15	2	18,555	16	6½

The feus, rents, and other revenues at the wet docks, for the year 1836, amounted to L.3108. 19s. 3½d.

Amount of Shipping entering Leith since 1760.

Years.	Tons.
1760	34,000
1770	66,000
1781	63,000
1788	117,000
1801	186,000
1810	266,000
1815	257,000
1818	341,000
1821	312,000
1824	342,000
1827	365,000
1830	308,000
1832	309,000
1834	340,000
1835	340,540

The want of a sufficient depth of water, as has been elsewhere remarked, is one of the great disadvantages under which Leith labours. At present, after all that has been done to remedy this evil, there are only seventeen feet water on the bar at high water during spring-tides, and only fourteen during neap tides. The depth of water is indicated to vessels approaching, or at anchor in the roads, from a small light-house erected on the pier, by a train of signals during the day, and at night by a stationary light, which is exhibited whilst there are nine feet water on the bar.

Vessels that do not choose to enter the harbour, or that cannot enter it in consequence of drawing too much water, anchor in the roads off the town, at the distance of about a mile and a half or two miles, where they have from four to six fathoms water, with good anchorage ground.

There are three companies belonging to the town, engaged in the London and Leith trade, who have altogether eighteen vessels in constant intercourse with the two ports. One of these companies has, besides, three large steamships for passengers and goods in the same trade. There is also a company in the Leith and Hull trade, with five vessels; a company in the Liverpool and Leith trade, with five vessels; a company in the Leith and Newcastle trade, with four vessels; one in the Hamburg and Rotterdam trade, with eight vessels; one in the Aberdeen trade, with four vessels; one in the Inverness trade, with two vessels; one in the trade with Wick, with two vessels; one in the Helmsdale trade, with one vessel; one in the Greenock trade, with four vessels; besides companies which trade with different parts of Fife, with Dundee, Stirling, and other places. To these may be added, a Newcastle steamer, which sails once a week in winter, and twice a week in summer; two regular traders to Peterhead, one to Berwick, and one to Banff.

There are five vessels belonging to the port, engaged in the Greenland trade. Formerly, that is, within these three or four years, there were seven, but they are now reduced to the number stated.

The municipal government of Leith was formerly vested virtually, and at an earlier period literally, in the town council of Edinburgh, which exercised an uncontrolled judicial authority over the town and suburbs. But by a bill William 3 and 4, cap. 77, passed on the 28th August 1833, and which came into operation on the first Tuesday of November following, Leith was rendered wholly independent of the city of Edinburgh in the constitution and exercise of its municipal government, the latter being invested in a provost, four bailies, and twenty-five councillors, with their officers, to be chosen by the inhabitants by popular election.

The judicial authority of Edinburgh over Leith, therefore, is now entirely abolished, and the former discharged from interfering with or exercising any control over the affairs of the town. This, however, does not extend to the city's rights in the harbour and docks, nor to the revenues arising therefrom, which remain untouched. The provost and treasurer remain each three years in office, whilst the councillors go out by a special order of rotation specified in the act.

By the same act the admiralty jurisdiction, which was formerly invested in the council of Edinburgh, has been transferred to the provost and magistrates of Leith; the former being admiral, and the latter depute-admirals, inheriting all the rights, power, and privileges connected with this jurisdiction enjoyed by the body by which it was formerly exercised.

Leith has also a resident sheriff-substitute, an officer of recent appointment, who holds a small debt court every Friday. This functionary, whose salary is L.200 per annum, is paid out of the funds of the burgh; but this burden on the latter ceases with the death or removal of the present incumbent, Leith being declared relieved in such case from all charge for any future sheriff-substitute that may be appointed. Leith, together with Musselburgh, including Fisherrow, Portobello, and Newhaven, returns a member to parliament. The town is lighted with coal-gas, manufactured there by a joint-stock company; and is supplied with water by a branch of the pipes by which Edinburgh is furnished with that article.

The town's expenses are defrayed by a heavy assessment upon the inhabitants. Neither literature nor the fine arts are much cultivated in Leith. A laudable and successful attempt, however, has been made to introduce at least one branch of the latter, viz. music. In 1830, a Philharmonic Society was instituted, which has since acquired considerable celebrity. There are also two public subscription libraries, and a mechanics' institution, with a library and lecture-room, in the Exchange Buildings.

Having concluded our sketch of Leith, we have only to add, that we have studiously avoided all allusion to the protracted disputes in which it has been engaged with the city of Edinburgh, not thinking these fit matter for a work of this nature. The population of the parishes of North and South Leith in 1831 was 26,000, and is now estimated at 30,000.

LEITOMISCHEL, a city of the circle of Chrudim, in the Austrian kingdom of Bohemia. It stands on the river Lauzna, and contains 634 houses, with 4653 inhabitants, who are occupied in making muslins and other cotton goods, and in distilleries. There is a college with six professors, and a gymnasium or public classical school.

LEITRIM, a maritime county of the province of Connaught, in Ireland, is bounded on the north by the Atlantic and the counties of Donegal and Fermanagh, on the east by the counties of Fermanagh and Cavan, on the south by those of Longford and Roscommon, and on the west by Roscommon and Sligo. In shape it has been compared to an hour-glass, broad at both ends, and contracted in the middle. Its greatest length, measured from south-east to north-west, is fifty-two miles; its breadth where broadest is twenty, and where narrowest not more than seven miles; extending over an area of 420,375 acres, of which 266,640, or little more than one half, are cultivated land, 128,167 are bog or unimproveable mountain, and 25,568 are under water.

The county, which derives its name from an obscure village on the Shannon, is supposed to have formed part of the region inhabited by the tribe of the Nagnatæ in the time of Ptolemy. The Irish chroniclers distinguish it by the name of Hy-Brune-Brefinc, or Brennie. The family of O'Ruarck, which derived its descent from Roderic, king of Ireland, held in it the rank of chieftain; and under him were those of O'Murrey, M'Loghlin, M'Glanchie, and

M'Granell. It was made shire-ground, together with the other counties in Connaught, by Queen Elizabeth; and is now divided into the five baronies of Carrigallon, Dromahaire, Leitrim, Mohill, and Rosclogher. These baronies are subdivided into seventeen parishes, of which ten are in the diocese of Kilmore, and seven in that of Ardagh. For the greater convenience of transacting the sessional business of the county, it is divided into two districts; that of Manor-Hamilton in the north, comprising the baronies of Rosclogher and Dromahaire; and that of Carrick-on-Shannon to the south, comprehending the three southern baronies.

The climate is not only colder than the more southern counties, but also moister, owing to the number and height of the mountains with which the greater part of its surface is overspread. The whole of the northern part of the county is mountainous. Lugnaquilla, the most elevated of the mountains, rises to the height of 1485 feet; Benbo is 1403 feet high; Lacka, 1315; the Green Mountain, 950 feet. More southerly are Slieve-an-Eirin and Bencroi. Large tracts of ground comparatively level are to be found in the southern part of the county, the greater part of which is well wooded, fertile, and abounding in picturesque scenery. The soil in general is stiff, heavy, cold, and wet. The tops and sides of most of the hills are covered with a thin ferruginous loam, based upon a hard gravel. The valleys, which are in general well watered, are of a quality superior to the hills, deeper in mould, and much more fertile. The more level tracts, already noticed, are a dark rich soil on a limestone bottom.

The county is not more remarkable for its mountains than for its lakes. The principal is Lough Allen, situated in its centre, where narrowest. It is eight miles long from north to south, and four where broadest, and may be looked upon as the great reservoir and distributer of all the running water in the county, and the embryo feeder of every canal that may be made to traverse it. Storms on this lake are violent, and the waves run very high. The boatmen who navigate it assert that it is unfathomable in some parts. A few miles to the north is Lough Clean, or Belhovel Lake, which discharges its waters into Lough Allen by a stream of some magnitude. Several smaller sheets of water are scattered throughout the southern baronies. On the borders are Lough Gill, Lough Melvyn, Lough Cane, and Lough Boffin. The Shannon is said by some writers to take its rise in Lough Clean, but its source is more generally reputed to be in Quilca Mountain, where it is known by the name of Avonmore, or the Great River, to distinguish it from the many lesser streams that, like it, contribute to feed the great central lake. Issuing from the southern extremity of Lough Allen, it forms the western boundary of the county. The Bonnet rises near Lough Clean, and falls into Lough Gilly. The small rivers Bundrows and Brinduff, which separate Leitrim from Donegal and Sligo, contain between their mouths the scanty line of three miles of sea-coast belonging to the county. Many other streams, too small to be particularly noticed, and discharging themselves into some of the numerous lakes or larger rivers, afford a copious and perennial supply of water.

The central parts of the county form part of the great coal-fields of Ireland. The principal vein is in Bencroi Mountain, the summit of which is bog. The works originally belonged to the O'Reillys, from whom they devolved by mortgage to one of the Latouche family, who, after a very great expenditure, relinquished them. The coal is not considered as of good quality. Coal has also been found in the hill of Lacka, and in Lugnaquilla, where it crops out at an elevation of about 1170 feet above the sea level, at Meneask. Iron-ore abounds in the Slieve-na-Eirin, or Iron Mountain. On its northern side, where the interior has been denuded by the mountain floods, the metal shows itself in large quantities, alternating with strata of limestone. The ore here is considered as richer than that of Roscommon. It was worked until the failure of timber and the want of a sufficient supply of mineral coal put a stop to the operations. Indications of the same ore are to be found in several other parts of the mountainous district, and even in the interior of the plain country, near the Shannon. Indeed the soil is so deeply and extensively impregnated with it, that the inhabitants, who have not the means of rendering it profitable, denounce it as the bane of the country. Lead has been found near Lurganboy. Upon the north side of Benbo Mountain are pits whence copper has been extracted. Manganese is also found in large quantities, as is pipe clay, yellow ochre, white and brown chalks, clays of various hues, and sand suited for the manufacture of glass. The substratum of the parts of the county north and south of the coal and iron district is chiefly limestone, interspersed occasionally with sandstone. Benbo is granitic. The quantity of bog is estimated to occupy 7234 acres. Its general depth is thirty feet, and it rests on a stratum of marl or blue clay. The highest level of any of the bogs above the Shannon at Lough Reagh is 114 feet, that of the lowest twenty-nine. All are so far elevated as to admit of drainage. There is a sulphureous spa at Drumsna, in high repute for cutaneous disorders, and by many considered as more effective than that of Swadlinbar. There are also others of the same quality at Annaghduff, Meelock, and Attymanus, and in some other places. Cavan spa is a chalybeate, issuing from the southern part of a peninsula in the north of Lough Allen. Oakfield spa, likewise chalybeate, is near the sea. Both are visited for their supposed sanative qualities.

The population, like that of every other part of Ireland, has been progressively on the increase ever since any series of systematic observations have been directed to ascertain it. The following are the most important epochs of its increase:—

1760	De Burgho	26,142
1792	Beaufort	50,000
1813	Parliamentary census	94,095
1821	Ditto	124,785
1831	Ditto	141,303

The foregoing table exhibits an increase upwards of quintuple in seventy years. But it is to be observed, that the ratio of increase between the first and last parliamentary census, which may be deemed to have been taken with greater accuracy than those of former years, which rest chiefly on conjectural computation, does not establish the authenticity of such a rapid increase. The average of population to the superficial contents of the county gives a rate of one inhabitant to one acre and eighty-eight hundred parts.

This population was represented in the Irish House of Commons by six members, two for the county at large, and two for each of the close boroughs of Carrick-on-Shannon and Jamestown. The union struck off the borough representatives, and as no change has been made in this point by the reform act, the county now sends but two members to the imperial parliament. The state of the constituency, as affected by the legislative alterations made since the passing of the Catholic emancipation bill, by which the right of the forty-shilling freeholders to vote in the election of representatives was abolished, exhibits the following results:—

Date.	L.50.	L.20.	L.10.	40s.	Total.
Jan. 1829,	174	86	—	6101	6361
Jan. 1830,	196	128	278	—	602
Jan. 1832,	156	144	1018	—	1318

Hence it appears, that whilst, previously to the extinction of the forty-shilling freeholders, there was one elector for every four families nearly, the number was reduced, after the change, to one for every eighteen.

The state of crime may be estimated, to a certain degree, from the following return of the numbers committed for criminal offences during the seven years ending December 1834, viz:—

1828	380	1832	293
1829	372	1833	389
1830	282	1834	330
1831	209		

The foregoing statement is taken from the annual report of the inspectors-general of prisons. Another return from the county officers gives the following result for the year 1834, which is both more specific, and varies from the other in no small degree as to the number of committals. The great excess of persons discharged unpunished above those convicted presents a very extraordinary characteristic as to the administration of justice in this, as in many other counties. Capital executions are very uncommon here.

Committals in 1834	628
Convictions	109
Acquittals by jury	153
No bills found	66
No prosecution	208
Bailed and not tried	5
Remaining for trial	87
Total not convicted	519

The state of public education, as collected from the parliamentary inquiries in 1821 and 1824–26, may be inferred from the following table. The information on this interesting topic, collected by the late commission of public instruction, having been made up according to dioceses, instead of counties, as had been the case in the preceding parliamentary returns, precludes the possibility of giving a statement either of the numbers of children receiving instruction, or of the comparative amount of the different religious persuasions, for the year 1834.

Year.	Boys.	Girls.	Sex not ascertained.	Total.
1821,	3580	1609	—	5,189
1824–6,	6736	3627	770	11,135

Of the numbers in the latter of these returns, 2147 were of the established church, twenty-seven were dissenters, 7757 Roman catholics, and 1204 whose religious persuasion could not be ascertained. The total number of schools was 242, of which twenty-one, educating 1181 pupils, were maintained by grants of public money; sixty-four, educating 3113, derived their support from private contributions; and the remaining 157 schools, educating 6841 pupils, were supported wholly by the fees of those who received instruction in them.

The quantity of land under tillage is small, and the plough little used excepting in the champaign districts. In the other parts the mode of culture is by the loy, a narrow spade with a long handle. The hills are generally steep, and, though abounding with stones, are tough, and retentive of moisture. The loy penetrates into this species of soil more easily than the common broad spade, and the length of its handle serves as a lever to overcome the resistance of the tenacious soil. Potatoes are planted with a steveen, which is a stake about four feet long and three inches in diameter, tapering to a point at the lower end, near which a cross piece is fixed to rest the foot on whilst pressing the implement into the ground. The seed is dropped into the hole thus made, which is then filled up with mould. Oats are the general crop; barley is but little grown; rye and wheat still less. Flax forms a part of the usual rotation of crops. Tillage farms are small; those for grazing are of considerable size, and often held by several tenants in common. The grasses are mostly natural, and in general excellent, producing fat and well-flavoured meat, and excellent milk and butter. Dairies of large size are seldom to be met with, but every small farmer produces butter to dispose of at some of the neighbouring markets. Green food is seldom used. The cattle are housed in some parts from December to May, whilst in others they are left out during the winter. The usual fence is a drain, backed at one side with a bank of clammy aluminous earth, about three or four feet high. The ditch thus made soon hardens into a consistency nearly equal to brick, and answers every purpose of fencing except against sheep, in which case it is topped with brushwood. Stone-walls are few. Hawthorn hedges are to be met with in some parts. Manures are rich and abundant. Every part has a command of limestone, either solid, or in gravel or marl. The farmers living upon the confined verge of sea-coast within the county industriously take advantage of the sea-weeds, shells, and gravel found there. Much attention is paid to the collection of every kind of manure. The farm-houses are generally long, narrow buildings, of one story high, with a yard before them, of which the offices form the sides. The repairs are always made by the landlord, a custom very uncommon in other counties. Leases are generally for three lives, or thirty-one years. Non-alienation clauses are common, and the tenant is sometimes bound down to manure a certain portion of the land.

The manufactures are confined to that of coarse linen, the weaving of which is carried on to a considerable extent. Potteries of coarse vessels are numerous about Leitrim and Dromahaire. The only navigable river by which an inland trade can be carried on is the Shannon. About fifty years ago a canal was opened from near Longford to Battlebridge, about three miles south of Lough Allen, in order to form a water communication thence to Limerick. This canal, if completed to the lough, would enable boats to ply thence to Dublin by its connection with the Royal Canal at Tarmenbarry. There are no fisheries of any consequence, although many kinds of fresh-water fish, particularly perch, may be caught in great abundance.

The general food of the peasantry is potatoes and oaten bread, with butter and eggs occasionally, and flesh meat at the great festivals. The clothing is neat, clean, and substantial; the coat usually of native frize, and the waistcoat and breeches of corduroy. In their general demeanour the peasantry are kind, warm-hearted, and amenable to the laws. They are, like those of most other parts of Ireland, singularly attached to peculiar places of interment. One of the most frequented of these is on a small island near the entrance of the Shannon into Lough Neagh, where there are the remains of a church. It has been from time immemorial the burying-place for the residents in all the surrounding country; and when access to it is prevented on such occasions, by the stormy state of the lake, the friends of the deceased prefer remaining on the shore by the putrefying corpse, until the weather become favourable enough to permit a passage across, to removing it for interment elsewhere. The frequent occurrence of fatal accidents in these funereal voyages induced a neighbouring gentleman to have a piece of ground upon the adjoining mainland consecrated as a cemetery, but to no purpose. The survivors preferred awaiting all chances of weather rather than relinquish the idea of depositing the bones of their departed friend with those of his forefathers. The mountainous districts are thickly peopled, but have few resident proprietors. The lowest classes there speak Irish. They have a singular custom, when they have recourse to blood-letting, of opening a vein in each arm, in order to let the blood run even. Dancing is the favourite amusement in convivial meetings; every one is fond of displaying his agility in this enlivening exercise. At weddings the men ride to the place of worship, each horseman having a woman behind him, except the bridegroom, who rides single. When a person is seen riding on a pyebald horse, it is considered as a sign that he is a physician. The cabin-doors in these districts are of wicker-work, lined in the inside by a mat. The harness for the cattle is exceedingly rude, being little more than a hay rope or band. The people in the neighbourhood of the iron-works appear to live in a state of extreme misery. They are wretchedly clothed, and dwell in mud houses filled with smoke. The vicinity of the three counties of Leitrim, Cavan, and Sligo to each other, gives occasion to party feuds, which often lead to desperate battles between hostile clans or factions, that never terminate without bloodshed, and not unfrequently with loss of life.

There are but few remains of ancient Irish antiquities. The most remarkable are two druidical altars; one very large near Fenagh, the other of smaller dimensions at Letterfyan. They are called by the natives Leaba Dearmud is Graine, or Darby's and Graine's bed. The principal monastic buildings of which any vestiges can now be traced, are the following. Crevlea, near the river Bonnet, built by Margaret, widow of O'Ruarck, in 1509. The walls, which are nearly entire, have on them some curious figures, and contain several antique monuments. Fionagh, in Fenagh parish, still exhibits a window of fine workmanship: the place was anciently celebrated as a school of divinity, and was resorted to by students from many parts of Europe. A Franciscan friary, at Jamestown, was remarkable in the eventful period of 1641, as being the place where the Roman Catholic clergy assembled, and nominated commissioners to treat with such foreign powers as were willing to assist them in their struggle against the usurped authorities which then governed England. Clone, near a small river of the same name in Mohill barony, has still some ruins to point out its site. Mohill Abbey, Annaghduff, and Drumleas, have been converted into parish churches. Some others are known only by name. Amongst the military antiquities may be noticed O'Rorke's Hall, at Dromahaire, near the Bonnet, the destruction of which was expedited by using its materials for the construction of the neighbouring castle of Dromahaire, supposed to have been built by Sir William Villiers in the year 1628. Other castles, built by various members of the O'Ruarck family, are those of Longfield, Cloncorrick, Castle Cor, and one on the banks of Lough Gill. Woodford House is built on the site of another of the O'Ruarcks' castles. Manor-Hamilton Castle, built by Sir Frederick Hamilton, in the reign of Elizabeth, is by much the largest, best built, and handsomest in the county. Castle John stands on an island in the little lake of Lough Scur. Dungarbery Castle, near the sea, is of the era of Elizabeth.

The population of Leitrim may be said to be wholly rural: no town in it contains two thousand inhabitants. Carrick-on-Shannon, the county town, where the assizes are held, and all the public business transacted, contains no more than 1428 inhabitants. Though well circumstanced for inland trade, from its situation on a fine navigable river, no advantage has been taken of its position. Its only public buildings are a court-house, a jail, a chapel of ease, and a barrack. The mail-coach road to Sligo passes through it. The only other towns whose population exceeds a thousand souls are, Mohill, which contains 1606, and Manor-Hamilton, which has 1348 inhabitants.

LEIXLIP, a post and fair town of Ireland, pleasantly situated in the county of Kildare and province of Leinster, about eight miles from Dublin. Near it are the ruins of the church and castle of Confy. The castle of Leixlip is beautifully situated on the banks of the river Liffey. It is a fine edifice, with large and pleasant gardens, at one side of which is a fine waterfall called the *Salmon leap*, there being plenty of that species of fish hereabouts. A mile from this is Castletown, the magnificent seat of Mr Conolly.

LELAND, John, an eminent English antiquarian, was born in London about the year 1507. Having lost his parents when a child, he had the good fortune to find a friend and patron in a Mr Thomas Myles, who placed him in St Paul's school, of which the grammarian William Lilly was master. From that school he was sent to Christ's College, Cambridge, whence, after some years' residence, he removed to All Souls, Oxford. From Oxford he went to Paris, chiefly with a design to study the Greek language, which at that time was but little understood in this kingdom. Upon his return to England he took orders, and was soon afterwards appointed chaplain to King Henry VIII., who also gave him the rectory of Poppeling, in the marches of Calais; appointed him his librarian; and in 1533 granted to him, by commission under the great seal, the office of king's antiquary, an office never borne by any other person before or since. By this commission he was empowered to search for ancient writings in all the libraries of abbeys, priories, colleges, cathedrals, and places where "records, writings, and secrets of antiquity were reposited" in his majesty's dominions. We are informed by one of his biographers, that he renounced popery soon after his return to England; but no authority is quoted for his statement. Be this as it may, in 1536 he obtained a dispensation to keep a curate at Poppeling, and set out on his journey in quest of antiquities. In this employment he spent six years, during which time he visited every part of England where monuments of antiquity were expected to be found. After his return, in the year 1542, he was presented by the king to the rich rectory of Haseley in Oxfordshire; and in the following year Henry gave him a prebend of King's College, now Christ's Church, Oxford, besides that of East and West Knowle, in the cathedral of Salisbury. Being thus amply provided for, he retired to a house of his own in the parish of St Michael le Querne in London, where he spent six years more in digesting the materials which he had collected. Henry VIII. died in 1547; and in a short time afterwards poor Leland appears to have lost his senses. He was at first seized with a deep melancholy, which was succeeded by a total deprivation of reason. In this lamentable state he continued till the beginning of the year 1552, when he was happily released by death. He was buried in the church of St Michael le Querne, which was destroyed by the fire in 1666. Leland was a man of great learning, an accomplished linguist, and an indefatigable and skilful antiquarian. Upon his death, Edward VI. gave all Leland's papers to Sir John Cheke, his tutor, and Latin secretary of state. When this king died, Sir John, being obliged to leave the kingdom, gave to Mr Humphrey Purefoy four folio volumes of Leland's collections, which, in 1612, were transferred by his son to William Burton, author of the history of Leicestershire. This gentleman also became possessed of the Itinerary in eight vols. folio, which, in 1632, he deposited in the Bodleian Library. After the death of Sir John Cheke, many other of Leland's manuscripts fell into the hands of Lord Paget, Sir William Cecil, and others, and at last fortunately came into the possession of Sir John Cotton. These were of great use to all our succeeding antiquarians, particularly Camden, Dugdale, Stowe, Lambard, Batteley, and Antony Wood. His Itinerary throughout most parts of England and Wales was published by Mr Hearne, in nine vols. 8vo, 1710–1711; as was also his *Collectanea de Rebus Britannicis*, six vols. 8vo, 1715.

LELAND, *John*, a distinguished writer in defence of the Christian religion, was born at Wigan, Lancashire, in 1691, and descended of eminently pious and virtuous parents, who took the earliest care to season his mind with proper instructions. But, in his sixth year, the small-pox deprived him of his understanding and memory, and expunged all his former ideas. He continued in this deplorable state near twelve months, when his faculties seemed to spring up anew; and though he did not retain the least traces of any impressions made on him before the distemper, yet he now discovered a quick apprehension and strong memory. In a few years afterwards his parents settled in Dublin. When he was properly qualified by years and study, he was called to officiate as pastor to a congregation of Protestant dissenters in that city. He was an able and acceptable preacher, but his labours were not confined to the pulpit. The many attacks made on Christianity, and by some writers of no contemptible abilities, induced him to consider the subject with the greatest care, and the most faithful examination. Upon the most deliberate inquiry, the truth and divine original, as well as the excellence and importance, of Christianity, appeared to him so clear and certain, that he published answers to several authors who appeared successively in that cause. He was indeed a master in this controversy; and his View of the Deistical Writers that have appeared in England, is very greatly and deservedly esteemed. In the decline of life he published another laborious work on the Advantage and Necessity of the Christian Revelation, shown from the State of Religion in the ancient Heathen World, especially with respect to the Knowledge and Worship of the one true God, in two vols. 4to. This noble and extensive subject, the several parts of which have been slightly and occasionally handled by other writers, Leland treated at large with the greatest care, accuracy, and candour. In his View of the Deistical Writers, his cool and dispassionate manner of treating their arguments, and his solid confutation of them, have contributed much more to depress the cause of infidelity than the angry zeal of intemperate disputants. Besides his learning and abilities, his amiable temper, great modesty, and exemplary life, recommended his memory to general esteem and affection. He died in 1766.

LELEGEIS, the ancient name of Miletus, from the Leleges, the first inhabitants of it.

LELEGES, anciently a people of Asia, of Greek origin; the name denoting "a collection of people." They first occupied the islands; then passing over to the continent, they settled partly in Mysia, on the Sinus Adramyttenus, and partly in that part of Ionia next to Caria. There were also Leleges of Laconia. These went to the Trojan war with Altes their king. Achilles plundered their country, and obliged them to retire to the neighbourhood of Halicarnassus, where they fixed their habitation. The inhabitants of Laconia and of Megara also bore this name for some time, from Lelex, one of their kings.

LELY, Sir Peter, an eminent painter, was born in Westphalia in the year 1617. He was placed as a disciple with Peter Grebber at Haerlem; and in 1641 was induced, by the encouragement which Charles I. gave to the fine arts, to visit England. He became state-painter to Charles II., who knighted him; and being a gentleman as well as a painter, that king took pleasure in conversing with him. He practised portrait-painting, and succeeded so well that he was preferred to all his contemporaries. Hence he was so much engaged in business, that he was prevented from visiting Italy to finish the course of his studies. However, he made himself amends, by getting the best drawings, prints, and paintings, of the most celebrated Italian masters. Amongst these were the greater part of the Arundel collection, which he received from the family of that name, many pieces of which were sold after his death at prodigious rates, bearing upon them his usual mark. The advantage which he reaped from this collection, the best chosen of any one of his time, appears from the admirable style which he acquired by daily conversing with the works of those great masters. In his correct drawing and beautiful colouring, but more especially in the graceful airs of his heads, and the pleasing variety of his postures, together with the gentle and loose management of the draperies, he excelled most of his predecessors. Yet the critics remark, that he preserved in almost all his female faces a drowsy sweetness of the eyes peculiar to himself, and for which he is reckoned a mannerist. The hands of his portraits are remarkably fine and elegantly turned; and he frequently added landscapes in the back-grounds of his pictures, in a style peculiar to himself. He likewise excelled in crayon-painting. He was familiar with, and greatly respected by, persons of the greatest eminence in the kingdom. He became enamoured of a beautiful English lady, to whom he was some time afterwards married; and he purchased an estate at Kew, in the county of Surrey, to which he often retired in the latter part of his life. He died of apoplexy in 1680, at London, and was buried at Covent Garden Church, where there is a marble monument erected to his memory.

LEMBERG, a circle in the Austrian province of Gallicia, extending over 1090 square miles. It comprehends four cities, two market-towns, and 167 villages, with 18,551 houses, inhabited by 140,468 individuals, of whom 18,550 are Jews. The capital of the circle, as of the province, is a city of the same name, but recently has assumed the name of Lopoldstadt. It is situated on the river Peltew, which runs into the Vistula. It is surrounded with gentle elevations, in a fertile district, and, though antique, is well built, especially in the suburbs. It contains a Catholic, an Arminian, and a Greek cathedral, with eleven other churches, nine monasteries, and a Lutheran chapel. There are, in 2515 houses, 41,490 inhabitants. It is a place of considerable trade, which is chiefly in the hands of the Jews. There are some manufactures of linen and woollen cloth, of ribbons, turnery ware, and musical instruments; but the trade rather arises from its being the seat of government, than from any productions of internal creation. There is a university with no less than twenty-six professors, and an academy with six teachers. There is also a public library, much increased of late years. It is in long. 24. 3. 20. E. and lat. 49. 51. 42. N.

LEMERY, Nicholas, a celebrated chemist, born at Rouen, in Normandy, in 1645. After having made the tour of France, he, in 1672, commenced an acquaintance with Martyn, apothecary to the prince, and performed several courses of chemistry in the laboratory of this chemist, at the Hôtel de Condé, which were the means of making him known to the prince. He provided himself at length with a laboratory of his own, and might have been created a doctor of physic; but he chose to continue an apothecary, from his attachment to chemistry. He opened public lectures on that subject; and his confluence of scholars was so great as scarcely to allow him room to perform his operations. The true principles of chemistry were but ill understood in his time. Lemery was the first who abolished the senseless jargon of barbarous terms, reduced the science to clear and simple ideas, and promised nothing which he did not perform. In 1681 he was disturbed on account of his religion, and came to England, where he was well received by Charles II.; but affairs not promising him the tranquillity he had sought for, he returned to France, and took shelter under a doctor's degree. The revocation of the edict of Nantes, however, drove him into the communion of the Catholic church to avoid persecution. He then became associate-chemist and pensionary in the Royal Academy of Sciences, and died in 1715. He wrote, 1. A Course of Chemistry; 2. An universal Pharmacopœia; 3. An universal Treatise of Drugs; and, 4. a Treatise on Antimony.

LEMGO, a city of the principality of Lippe-Detmold, in Germany, the capital of the bailiwick of Brake. It is situated on the river Vega, and is the largest place in the dominion, containing the palace of the sovereign, the courts

Lemma || Lemonnier.

of justice, the institutions for education, and 640 houses, with 3570 inhabitants. It was formerly one of the Hans Towns, but has now little trade, and only manufactures fine linen. Long. 8. 49. 13. E. Lat. 52. 1. 40. N.

LEMMA (from λαμβανω, *I assume*), in *Mathematics*, denotes a previous proposition, laid down in order to clear the way for some following demonstration, and prefixed either to theorems, in order to render their demonstration less perplexed and intricate, or to problems, to make their resolution shorter and more easy. Thus, to prove a pyramid one third of a prism or parallelopiped, of the same base and altitude, the demonstration of which in the ordinary way is difficult and troublesome; this lemma may be premised which is proved in the rules of progression, that the sum of the series of the squares, in numbers in arithmetical progression, beginning from 0, and going on, 1, 4, 9, 16, 25, 36, &c. is always subtriple of the sum of as many terms, each equal to the greatest; or is always one third of the greatest term multiplied by the number of terms. Thus, to find the inflection of a curve line, this lemma is first premised, that a tangent may be drawn to the given curve in a given point. So, in physics, to the demonstration of most propositions, certain lemmata are necessary to be allowed, as that there is no penetration of dimensions, that all matter is divisible, and the like.

LEMNIAN EARTH, *Terra Lemnia*, a medicinal, astringent sort of earth, of a fatty consistence and reddish colour. It derives its name from the island of Lemnos, whence it is chiefly brought. Many form it into round cakes, and impress a seal upon it; and hence it is also called *terra sigillata*.

LEMNIUS, LÆVINUS, a famous physician, born in Zealand in 1505. He practised physic with much applause; and, having taken holy orders, became canon of Ziric Zee, where he died in 1560. He left several works, the principal of which is entitled *De occultis Naturæ Miraculis*.

LEMNOS, an island in the Archipelago, in the Turkish province of Lesbos or Midilly. It extends over 165 square miles, from north latitude 39. 46. to 40. 2. and from east longitude 24. 52. to 25. 33. It is very narrow in the middle, where there are two harbours on the opposite sides of the tongue of land which joins the two parts. These are mountainous, and, though not lofty, were in ancient times said to have been volcanic; and the warm springs near the mountain Therma confirm the opinion. The soil is not highly fertile, but it produces wheat, barley, grapes, figs, almonds, and some oil. Water is not abundant, and there is a great scarcity of fuel. The inhabitants are about 8000, mostly Greeks, and inhabit two towns and fifty villages, some of whom find occupation in the fisheries. The capital is the town of the same name, the ancient Myrina. It is the seat of a Greek bishop, is without walls, but protected by a castle, and has a small haven, and about 1000 inhabitants, of whom 300 are Turks. There are some establishments for building vessels, which is the principal employment of the population.

LEMON ISLAND, one of the Skelig Islands, situated off the coast of the county of Kerry, in the province of Munster, in Ireland. It is a round rock, always above water, and therefore nowise dangerous to ships. An incredible number of gannets and other birds breed here; and it is remarkable that gannets nestle nowhere on the southern coasts of Ireland except on this rock, though many of them are seen on all parts of the coast upon the wing. There is another rock on the northern coast of Ireland, remarkable for the same peculiarity.

LEMONADE, a liquor prepared from water, sugar, and lemon or citron juice, and which is very cooling and grateful.

LEMONNIER, PETER (CLAUDE) CHARLES, a diligent and accurate astronomer, born at Paris, on the 23d of November 1715, was the son of Peter Lemonnier, of St Sever, in Normandy.

His father was a professor of philosophy in the College d'Harcourt, and member of the Academy of Sciences. He distinguished himself, as a teacher, by his activity in promoting the introduction of mathematical reasoning into the Cartesian philosophy. Under such auspices, the son might have enjoyed facilities for the cultivation of any of the sciences; but he soon showed a decided preference for astronomy, and began to be a practical observer before he was sixteen. In the month of November 1732, Mr Fouchy procured him the use of a mural quadrant of three feet radius, and he soon applied himself with diligence to the determination of the sun's greatest equation, an investigation which he continued for many years; and in 1741, he found the equation to amount to 1° 55′ 31″; a quantity differing only by 7″ from Delambre's latest determination.

He presented to the Academy of Sciences, in 1735, an elaborate map of the moon, accompanied by some remarks; and in the month of April of the following year, before he was twenty-one years old, he was made a member of the Academy, in the character of Adjunct Geometrician. He continued to be a constant contributor to its Memoirs for more than fifty years. The winter of 1736 and 1737 he passed at Torneo, with Clairaut and Maupertuis, as a member of a committee appointed by the Academy for measuring a degree in Lapland; and he was not less zealous than any of his colleagues in the execution of that arduous undertaking.

He is considered as having effected, in conjunction with Lacaille, a complete reformation in the practical astronomy of France. He entered very early into correspondence with the English astronomers of the day; they had carried their instruments and modes of observation to a higher degree of perfection than their neighbours; and Lemonnier was of great use to the science, in making known to his countrymen the practical methods of Flamsteed, and in introducing the instruments of Graham and Bird. In April 1739, he was made a foreign member of the Royal Society of London, and for the last twelve or fourteen years of his life he is said to have been the senior member of the society. He was the first that introduced the effects of nutation, then lately discovered by Bradley, into the solar tables; and he complained bitterly of Lacaille's injustice, in not giving him due credit for the improvement.

The Duc de Noailles made him known to the king of France, who was fond of his company, and showed him many kindnesses. In 1742, he gave him apartments at the Capucins in the Rue St Honoré, where he continued to live till the Revolution. On another occasion, when he had taken great pains to fix an accurate meridian at St Sulpice, the king made him a present of 15,000 livres, which he expended in the purchase of instruments, as the greatest luxury that he was capable of enjoying.

The places of the stars, which he determined in 1740, served Lalande for the purpose of computing their proper motions, though they differed a little from the results of Bradley's observations. About 1746, he was much engaged in examining the inequalities of Saturn, produced by the attraction of Jupiter; and Euler employed his computations in the theory which obtained a prize in 1748; each confirming the accuracy of the other. He continued to observe the moon, without intermission, for fifty years, though a small part only of his observations was published.

In the year 1748 he went to England, partly for the purpose of obtaining further information from a personal acquaintance with the astronomers and opticians resident in London, and partly in order to observe the solar eclipse of that year, in a situation where it would be very nearly annular. He proceeded accordingly to Scotland with the Earl of Morton, accompanied by Short the optician, and they observed the eclipse together at Aberdour, an ancient residence of Lord Morton's, in Fifeshire. They obtained their time from the College at Edinburgh, where there was a transit instrument, by means of the flash of a cannon fired from the castle at twelve, and another five minutes after. "The eclipse was so nearly annular, that, at the nearest approach, the cusps seemed to want about one-seventh of the moon's circumference to be joined; yet a brown light was plainly observed, both by Lord Morton and myself," says Mr Short, "to proceed or stretch along the circumference of the moon, from each of the cusps, about one third of the whole distance of the cusps from each cusp; and there remained about one third of the whole distance of the cusps not enlightened by this brown light, so that we were for some time in suspense whether or not we were to have the eclipse annular with us. During the greatest darkness, the planet Venus was seen at Edinburgh, and other places, by a great number of people, but I did not hear of any other stars being seen. The darkness was not great, but the sky appeared of a faint languid colour." In fact, our mornings and evenings are always illuminated by a light, which has acquired more or less of a red tinge in its oblique passage through the atmosphere; and when we have a similar light without the redness, the contrast between the sensation and the memory makes it appear "faint," that is, greenish or grey, instead of white. Mr Lemonnier was particularly anxious to measure the moon's diameter, which "he found $29' 47\frac{1}{2}''$," agreeing precisely with the computed diameter, and not requiring any correction for the supposed effects of irradiation. A similar remark was made by a very accurate practical astronomer in the eclipse of 1820.

In order to verify the position of his mural quadrant, which was of eight feet radius, and made by Bird, Lemonnier felt the advantage of having a moveable one to compare with it, and he procured a block of marble eight feet by six, and fifteen inches thick, turning on an axis, to which he fixed his smaller instrument, of five feet radius, in order to be able to reverse its position. He devoted a considerable portion of his time to the investigation of the laws of magnetism, and especially to the variation of the compass; and he endeavoured to ascertain the effect of the moon's influence on the winds, and on the atmosphere in general.

Lemonnier had long disputed the accuracy of the Parisian base, measured by Cassini and Maraldi, but he was at last convinced that his objections were groundless. He was originally a most zealous friend and patron of Lalande; but afterwards, having taken offence at some slight cause, he refused to see him for many years. In fact, he appears to have been somewhat obstinate and irritable; but he is said to have had genius, zeal, activity, and intelligence, as well as credit in the world, and reputation among men of science. He was a voluminous writer; he had much learning and sagacity, but he often wanted precision in his language and his reasoning. In November 1791, he had a paralytic attack, which terminated his scientific career, though he survived it till the 2d of April 1799, when a second stroke carried him off, at Héril, near Baïeux. He was made, in the mean time, one of the 144 original members of the National Institute, as a testimony to the merit of his past labours.

He had married, in 1763, Mlle. de Cussy, a lady of very respectable family in Normandy. He had three daughters; the first married Mr de Parfouru, who was an early victim of the Revolution; the second the celebrated Lagrange; and the third her uncle, Lemonnier the physician, who was also a man of considerable science, and a member of the Royal Society of London.

From 1735 to 1790, there are very few volumes of the Memoirs of the Academy without one or more of Lemonnier's papers; but though not unimportant in the aggregate, they are somewhat uninteresting in the detail. They relate almost exclusively to astronomical observations; eclipses, occultations, appulses, oppositions, and conjunctions; solstices, longitudes and latitudes; with some accounts of astronomical instruments and apparatus. There are also some memoirs relating to the sun's equation and diameter, and on his place, as compared with Arcturus; on the motion of Saturn, and on his fifth satellite; on the expansion of wooden measures; on the transit of Venus, and on the diameter and the tables of that planet; on Euler's formula for parallax; on the variation of the needle; on lunar altitudes; on the tides; on horizontal refraction; on Saturn's ring; and on some currents of wind. He also published separately some extensive works, which acquired considerable celebrity.

1. The first was his Histoire Célèste, 4to, 1741, comprehending the interval from 1666 to 1685, and containing an account of a transit instrument of Graham's construction.

2. Théorie des Comètes, 1743, in 8vo, including a translation of Halley's work on comets, together with a method of computing the orbit from three observations.

3. Institutions Astronomiques, 4to, 1746; an improved translation of Keill's Astronomy, which long continued to be the best elementary treatise in the French language. It contains also solar tables, and a variety of other additions derived from observation.

4. Observations Astronomiques, part i. 1751; ii. 1754; iii. 1759; iv. 1775.

5. A Letter on the Theory of the Winds, in Halley's Tables, published by Chappe.

6. Nouveau Zodiaque, reduit à 1755, Paris, 1755, in 8vo, containing thirty-one pages of charts, much more complete than those of Senex, and superseded by some very late publications only.

7. A History of Astronomy in the Traité d'Aberration of Fontaine des Crutes.

8. Observations pour la Mésure du degré entre Paris et Amiens, 8vo, 1757.

9. Abrégé du Pilotage, par Goubert, 1766, in 4to, with additions.

10. Astronomie Nautique Lunaire, 8vo, 1771.

11. Exposition des Moyens les plus faciles de résoudre plusieurs questions dans l'Art de la Navigation, 1772, in 8vo, employing very generally a table of verse sines, and greatly recommending the use of Gunter's scale for nautical computations.

12. Essai sur les Marées, 1774, in 8vo, particularly describing the effects of the tides at Mont St Michel, and on the neighbouring flat sands, and including also some considerations on refraction, and on magnetism.

13. Déscription et Usage des principaux Instrumens d'Astronomie, 1774, folio, forming part of the collection of Arts et Métiers.

14. Atlas célèste de Flamsteed, 1776, in 4to, revised.

15. Lois du Magnétisme, 2 parts, 8vo, 1776–8, with an elaborate chart.

16. Traité de la Construction de Vaisseaux, par Chapman, 1779, folio, from the Swedish, and said to be less perfect than the translation of Vial du Clairbois.

17. Mémoires concernant diverses questions d'Astronomie et de Physique, 4 parts, 1781–4–6–8, in 4to.

18. De la Correction introduite pour accourcir la Ligne sèche du Lock de dix-huit pieds, 8vo, 1790.

19. Lettre au sujet d'une Eclipse, Par. 1791; together with some remarks on navigation, and on the cur-

rents of the South Seas, all apparently from the Memoirs of the Academy. The eclipse, which was observed as annular in China, should have been total, according to the computed distance of the luminaries concerned.

LEMURES, in *Antiquity*, spirits or hobgoblins, restless ghosts of departed persons, who return to terrify and torment the living.

These are the same with *larvæ*, which, according to the ancients, wandered throughout the world frightening good people, and plaguing the bad. For this reason, *lemuria* or feasts were instituted at Rome to appease the manes of the defunct.

Apuleius explains the ancient notion of manes. The souls of men released from the bonds of the body, and freed from performing their corporeal functions, become a kind of demons or genii, who were formerly called *lemures.* Of these *lemures*, those that were kind to their families were called *lares familiares ;* but those who, for their crimes, were condemned to wander continually, without meeting with any place of rest, terrifying good men, and vexing the bad, were vulgarly called *larvæ.*

An ancient commentator on Horace mentions, that the Romans wrote *lemures* for *remures*, a word formed from Remus, who was killed by his brother Romulus, and who returned to the earth to torment him. But Apuleius observes, that, in the ancient Latin tongue, *lemures* signifies the soul of a man separated from the body by death.

LEMURIA, or Lemuralia, a feast solemnized at Rome on the 9th of May, to pacify the manes of the dead, or in honour of the *lemures.* It was instituted by Romulus to appease the ghost of his murdered brother Remus, which he thought was continually pursuing him to revenge the crime. Sacrifices continued for three nights, the temples were shut up, and marriages were prohibited during the solemnity. A variety of whimsical ceremonies were performed, and the ghosts were desired to withdraw, without endeavouring to hurt or affright their friends above ground. The chief formalities were ablution, putting black beans into their mouths, and beating kettles and pans, to make the goblins keep at a respectful distance.

LENA, a large river of Asiatic Russia, which rises in the ridge of mountains to the north-west of Lake Baikal, and which flows almost from south-west to north-east, till near Yakoutsk. In this part of its course its tributaries are the Wilime and the Olekma ; and, combined with the Obi and the Toungouska, it furnishes an almost continued navigation across Siberia. Soon after passing the Yakoutsk, it receives the Aldane, the largest of its tributaries, by which the navigation is continued nearly to Okhotsk. Turning north-west from this point, and slightly declining to the west, it rolls through vast and uninhabited plains. The Wilhoui is the only other considerable one of its tributaries. It has a broad and deep channel, and it forms numerous islands, both in its course and in the sea at its mouth. The length of its course may be estimated at 2000 miles.

LENÆA, a festival observed by the Greeks in honour of Bacchus, at which there was much feasting and jollity, accompanied with poetical contentions, and the exhibition of tragedies.

LENDINARA, a town of Italy, in the Austrian delegation of Polesina. It is situated on the river Adigetto, is the capital of the district, and contains thirteen churches, and 5190 inhabitants, employed in various trades and manufactures.

LENDING-Houses. That it should have once been conceived unlawful to exact interest for the loan of money, will not appear surprising, when it is considered, that at an early period the occupations by which a man could support his family were neither so numerous nor so productive as in modern times. As money, therefore, was at that time sought to remove immediate necessity, those who advanced it were influenced by benevolence and friendship. But on the extension of trade, arts, and manufactures, money lent produced much more than what was adequate to the borrower's daily support, and therefore the lender might reasonably expect from him some remuneration. To the lending of money upon interest, according to the earliest accounts, succeeded the practice of establishing funds for the relief of the needy, on condition that they could deposit any thing equal in value to double the sum borrowed, for which they were to pay no interest. But as, on the one hand, the idea of exacting interest for the loan of money was odious to the members of the Catholic church in general, and as, on the other, it appeared proper and even necessary to pay interest for money to be employed in commerce, the pontiffs themselves at length allowed the lending-houses to take a moderate interest ; and in order not to alarm the prejudices of those to whom the measure was obnoxious, it was concealed under the name of being paid *pro indemnitate*, the expression made use of in the papal bull.

It appears that lending-houses, which gave money on the receipt of pledges, at a certain interest, are by no means of recent date ; for many houses of this description, in Italy at least, were established in the fifteenth century, by Marcus Bononiensis, Michel a Carcano, Cherubinus Spoletanus, Antonius Vercellensis, Bernardinus Tomitano, and others.

The lending-house at Perugia, established by Barnabas Interamnensis, was inspected in 1485 by Bernardinus, who augmented its capital, and in the same year established one at Assisi, which was confirmed by Pope Innocent, and visited and improved by its founder in the year 1487. He likewise established one at Mantua, after formidable opposition, having procured for it the sanction of the pope. The same person also founded lending-houses at Florence, Parma, Chieti, and Piacenza, in doing which he was sometimes well received, whilst at others he frequently met with great opposition. A house of this kind was established at Padua in the year 1491, and another at Ravenna, which were approved of and confirmed by Pope Alexander VI.

Long after the period here referred to, lending-houses were established at Rome and Naples ; that of the former city having been opened in 1539, and that of the latter probably in the following year. A lending-house was established at Nuremberg in Germany about 1618, the inhabitants having obtained from Italy the regulations of different houses, in order to select the best. In France, England, and the Netherlands, lending-houses were first known under the denomination of *Lombards.* Similar institutions were formed at Brussels in 1619, at Antwerp in 1620, and at Ghent in 1622.

Although such houses must be allowed to be of very considerable utility under certain circumstances, especially when interest is not allowed to be exorbitant, yet they were always odious in France. One was however established at Paris in 1626, in the reign of Louis XIII. which the managers next year were obliged to abandon. The *mont de piété* at that city, which has sometimes had in its possession forty casks full of gold watches that were pledged, was established by royal authority in the year 1777, as we learn from the Tableau de Paris, published at Hamburg in 1781.

LENFANT, James, a learned French writer, was born in 1661. After studying at Saumur, he went to Heidelberg, where he received imposition of hands for the ministry in 1684. He discharged the functions of this character with great reputation there, as chaplain of the electress dowager palatine, and pastor in ordinary to the French church. But the descent of the French into the palatinate obliged him to depart from Heidelberg in 1687. He went to Berlin, where the elector Frederick, afterwards king of Prussia, appointed him one of the ministers. He continued there thirty-nine years, distinguishing himself by his writings. He was preacher to the queen of Prussia, Charlotte Sophia, and, after her death, to the king of Prussia. In 1707 he took a journey to England and Holland, where he had the honour to preach before Queen Anne, and might have settled in London, with the title of chaplain to her majesty. In 1712 he went to Helmstadt, in 1715 to Leipsig, and in 1725 to Breslau, to search for rare books and manuscripts. It is not certain whether it was he that first formed the design of the *Bibliothèque Germanique*, which began in 1720; or whether it was suggested to him by one of the society of learned men, which took the name of *Anonymous*, and who ordinarily met at his house. He died in 1728. His principal works are, 1. The History of the Council of Constance, in two vols. 4to; 2. A History of the Council of Pisa, in two vols. 4to; 3. The New Testament, translated from the Greek into the French, with Notes by Beausobre and Lenfant, in two vols. 4to; 4. The History of Pope Joan, from Spanheim's Latin Dissertation; 5. Several pieces in the *Bibliothèque Choisie*, *La République des Lettres*, *La Bibliothèque Germanique*, and other publications.

LENGLET, Nicholas du Fresnoy, born at Beauvais, in France, 1674, was a prolific and useful French writer on a variety of subjects, historical, geographical, political, and philosophical. His chief productions are, a Method of Studying History, with a Catalogue of the Principal Historians of every Age and Country, published in 1713, a work which established his reputation as an historical writer, and was translated into most of the modern languages; and a Copious Abridgment of Universal History and Biography, in chronological order, under the title of *Tablettes Chronologiques*, which made its first appearance at Paris in 1744, in two vols. 8vo, and was universally admired by the literati in all parts of Europe. The author attended, with great candour, to well-founded and judicious criticisms. In subsequent editions he made several alterations and improvements; and from one of these, that of 1759, an English translation was made, and published at London in 1762, in two vols. 8vo. Du Fresnoy died in 1755. The Paris edition of 1759 was printed from the author's corrected copy; and the impression being sold off, another edition appeared in 1763, with considerable improvements by an unknown editor. To the biographical part a great number of names of respectable persons are added, not to be found in the former edition; and it has this advantage in the historical parts, that the general history is brought down to the year 1762. Du Fresnoy, however, has loaded his work with catalogues of saints, martyrs, councils, synods, heresies, schisms, and other ecclesiastical matters, fit only for the libraries of convents and colleges.

LENGTH, the extent of any thing material from end to end. In duration, it is applied to any space of time, whether long or short.

LENGTHENING, in ship-building, the operation of cutting a ship down across the middle, and adding a certain portion to her length. It is performed by sawing her planks asunder in different places of her length, on each side of the midship frame, to prevent her from being too much weakened in one place. The two ends are then drawn apart to a limited distance, which must be equal to the proposed addition of length. An intermediate piece of timber is next added to the keel, upon which a sufficient number of timbers are erected to fill up the vacancy produced by the separation. The two parts of the kelson are afterwards united by an additional piece, which is scored down upon the floor timbers, and as many beams as may be necessary are fixed across the ship in the new interval. Finally, the planks of the side are prolonged so as to unite with each other, and those of the ceiling are refitted in the same manner, by which the whole process is completed.

LENHAM, a town in the hundred of Eyhorne, and lathe of Aylesford, in the county of Kent, forty-five miles from London and ten from Maidstone, situated at the source of the river Len. It had formerly a market, which has been long discontinued. The population amounted in 1801 to 1434, in 1811 to 1509, in 1821 to 1959, and in 1831 to 2197.

LENNEP, a city, the capital of a circle of the same name, in the Prussian government of Dusseldorf. It is the chief seat of the fine broad cloth manufacture, in which machinery has been much extended of late years. It contains 480 houses, and about 5000 inhabitants, who have much increased, from the state of the trade.

LENKEROON, a port of Ghilan, in Persia, on the Caspian. Its harbour, being much safer than that of Reshd, is more frequented by the merchants. It exports silk in considerable quantity. The Russians attempted to storm it, but were repulsed with great loss. It is 110 miles north-west of Reshd.

LENNOX, or Dumbartonshire, a county of Scotland. See Dumbartonshire.

LENS, a piece of glass, or any other transparent substance, the surfaces of which are so formed that the rays of light, by passing through it, are made to change their direction, either tending to meet in a point beyond the lens, or rendered parallel after converging or diverging, or, lastly, proceeding as if they had issued from a point before they fell upon the lens. Some lenses are convex, or thicker in the middle; some concave, or thinner in the middle; some plano-convex, or plano-concave, that is, with one side flat, and the other convex or concave; and some are called *meniscuses*, or convex on one side and concave on the other.

Lenses are of two kinds, either blown or ground. *Blown lenses* are only made use of in the single microscope, and the common method of making them has been to draw out a fine thread of the soft white glass called crystal, and to convert the end of it into a spherule by melting it at the flame of a candle. Mr Nicholson observes, that window-glass affords excellent spherules. A thin piece from the edge of a pane of glass one tenth of an inch thick was held perpendicularly, and the flame of a candle was directed against it by means of the blow-pipe, when it became soft, and the lower end descended by its own weight to the distance of about two feet, where it remained suspended by a thin thread of glass about $\frac{1}{500}$th of an inch in diameter. A part of this thread was applied endwise to the lower blue part of the flame of the candle without the blow-pipe, when the end became instantly white-hot, and formed a globule, which was gradually thrust towards the flame till it became sufficiently large. A number of these were made, and examined by viewing their focal images with a deep magnifier, when they appeared to be bright, perfect, and round. *Ground lenses* are such as are rubbed into the shape required, and polished.

LENT, a solemn time of fasting in the Christian church, observed as a time of humiliation before Easter, and the great festival of our Saviour's resurrection.

Those who belong to the Catholic church, and some of the Protestant communion, maintain that it was always a fast of forty days, and, as such, of apostolical institution. Others think that it was only of ecclesiastical institution, and that it was variously observed in different churches, and grew by degrees from a fast of forty hours to a fast of forty days. This is the opinion of Morton, Bishop Taylor, Dumoulin, Daillé, and others.

Anciently the manner of observing Lent amongst those who were piously disposed, was to abstain from food till evening. Their only refreshment was a supper; and then it was indifferent whether it was flesh or any other food, provided it was used with sobriety and moderation.

Lent was thought to be the proper time for exercising more abundantly every species of charity. Thus what they spared from their own use, by abridging themselves of a meal, was usually given to the poor; they employed their vacant hours in visiting the sick and those that were in prison, in entertaining strangers, and in reconciling differences. The imperial laws forbade all prosecution of men in criminal actions, that might bring them to corporeal punishment and torture, during the whole of this season. It was a time of more than ordinary strictness and devotion, and therefore in many of the great churches they had religious assemblies for prayer and preaching every day. All public games and stage-plays were prohibited at this season; also the celebration of all festivals, birth-days, and marriages, as unsuitable to the occasion.

The Christians of the Greek church observe four lents. The first commences on the 15th of November; the second is the same with our lent; the third begins the week after Whitsuntide, and continues till the festival of St Peter and St Paul; and the fourth commences on the first of August, and lasts no longer than till the 15th. These lents are observed with great strictness and austerity; but on Saturdays and Sundays they indulge themselves in drinking wine and using oil, which are prohibited on other days.

LENTINI, a parliamentary city of the island of Sicily, in the kingdom of Naples, and province of Noto, 120 miles from Palermo. It is situated on some broken ground above the Leontine fields. The situation is subject to malaria, and, though it contains 1400 houses, the inhabitants scarcely exceed 5000. The surrounding district is highly productive of rice, hemp, corn, oil, and liquorice.

LEO X. Pope, second son of Lorenzo de' Medicis, was born at Florence in December 1475, and received the baptismal name of Giovanni, or John. He received the tonsure at seven years of age, his father having destined him for the church. Being even at that early period declared capable of clerical preferment, he obtained two rich abbeys, through the interest of his father with Louis XI. of France, and Sixtus IV. At a very early period he held no fewer than twenty-nine church preferments, a strong proof of the most scandalous corruption, as well as of the interest which his family enjoyed. In the time of Innocent VIII. he was promoted to the rank of cardinal, when no more than thirteen years of age, which took place in the year 1488. If the great influence of his father was unquestionably censurable in promoting the rapid and illegal advancement of his son, it is but justice to admit, that he employed all his efforts to qualify him for such premature dignity. Angelo Poliziano had the care of his early education, which was greatly accelerated by the uncommon gravity and solidity of his disposition. He was invested with the purple in 1492, and went afterwards to reside at Rome as one of the sacred college. Having opposed the election of Alexander VI. to the pontificate, he found it prudent to withdraw to Florence, in which place he acquired much personal esteem; but on the invasion of Italy by Charles VIII. of France, he was involved in the expulsion of his brother Pietro, and took refuge at Bologna. In 1499 he made a tour through the states of Venice, Germany, and France, and afterwards went to Rome, where, in consequence of his prudent behaviour, he lived safe and respected during the pontificate of Alexander.

In 1505, when thirty years of age, he began to take an active part in public affairs, and Julius II. appointed him governor of Perugia. As he adhered with unshaken resolution to the interest of the pope, he acquired the confidence of his holiness in so eminent a degree, that he was intrusted with the direction of the papal army against France; and, if he was not competent to conduct the military operations, he was of singular service in maintaining good order in the camp. He was taken prisoner at the bloody battle of Ravenna in 1512, and conveyed to Milan, where the dignity of his sacred office procured him respect. From this place he found means to escape, returned to Bologna, and assumed the government of the district in the capacity of the pope's legate.

At the election of a new pope in the room of Julius II. he was chosen to the pontificate, being then only thirty-eight years of age. Whatever might be the leading motives of the conclave for electing so young a pope, it is agreed on all hands that it was not effected by those corrupt practices too common on such occasions; and he ascended the throne under the name of Leo X. with stronger proofs of affection on the part of both Italians and foreigners than the greater part of his predecessors. He displayed his love of literature by the nomination of Bembo and Sadoleti as papal secretaries.

One of his first attempts was to free Italy from the dominion of foreign powers; and having taken into pay a large body of Swiss, he gained a victory over the French in the reign of Louis XII. at the bloody battle of Novara, by which means they were driven from Italy; whilst the king of France having incurred ecclesiastical censure, submitted in form, and received absolution. Having thus secured internal tranquillity, he turned his attention to the encouragement of literature and men of genius. He effected the restoration of the Roman university to its former splendour by means of new grants and privileges, and by filling the professorships with distinguished characters from every quarter. A Greek press was established in the city, and all Europe was informed that persons bringing ancient manuscripts to the pope would be liberally rewarded, besides having them printed at the expense of the holy see. He also promoted the study of oriental literature, and he had the honour of founding the first professorship of the Syriac and Chaldaic languages at Bologna.

On the death of Louis XII. of France, and the accession of Francis I. to the throne, it soon became apparent that a new war was inevitable in the north of Italy. Leo endeavoured to remain neutral, but without success; in consequence of which he joined in a league with the emperor, the king of Aragon, the states of Milan and Florence, and the Swiss cantons, against the French king and the state of Venice. But he soon found it expedient to desert his allies, and form a union with Francis, which took place in 1515, at an interview between the two sovereigns.

In 1517, the Duke of Urbino, whom he had expelled in order to make way for his nephew Lorenzo, collected an army, and by rapid movements regained his capital and dominions, which chagrined Leo to such a degree that he endeavoured to excite all the Christian princes against him. He raised an army under the command of his nephew, and the duke was finally compelled to relinquish his dominions upon honourable terms. In this year the life of Leo was in danger, and all his moments were embittered by a conspiracy against him in his own court. Petrucci, the ringleader, had formed a plan of destroying the pope by poison; but having failed in this attempt, he withdrew from Rome, still, however, carrying on a correspondence with his secretary. Some of his letters being intercepted, he was arrested on his way to Rome, committed to prison, and strangled, whilst his accomplices were put to death with the most severe tortures. To shelter himself from danger, whether real or imaginary, Leo created thirty-one new cardinals in one day, chiefly from amongst his own relations, though some of them were deserving of the dignity by their virtues and talents.

In the reign of this pontiff began the reformation of religion under the celebrated Martin Luther, who inflict-

Leon.

ed a wound on the Catholic church which will never probably be healed. Leo's taste for magnificence and expense having exhausted his coffers, he took from the church the profits arising from the sale of indulgences, for his own private emolument. These wares were extolled in language which shocked the pious and thinking part of mankind, and facilitated the progress of the reformation in the hands of such a man as Luther. The latter, during his opposition to the extravagance of Leo in the sale of indulgences, was still willing to be reconciled to the church; but as he insisted on making an unqualified appeal to the language of Scripture, and Leo would admit of nothing but an unqualified appeal to the decrees of the church, a reconciliation was found impossible. The works of Luther were burned in different places by Leo's command, and Luther in his turn made a solemn and public conflagration of the papal decrees and constitutions, and even of the bull itself. It was this pontiff who conferred on Henry VIII. of England the title of defender of the faith.

The private hours of Leo, it is said, were devoted to indolence, or to amusements, some of which were unworthy of his clerical dignity. He never lost sight of his favourite idea of expelling the French from Italy. The Swiss in the service of France having been induced to desert, the allies crossed the Adda, and occupied Milan without opposition. They next entered the territories of the Duke of Ferrara, who had espoused the cause of France. Many of his strong places were taken, and siege was about to be laid to his capital, when it was prevented by the indisposition of the pope, which in the space of eight days terminated in his death, on the 1st of December 1521, in the forty-sixth year of his age and the ninth of his pontificate.

LEOMINSTER, a borough and market-town of the hundred of Wolphy, in Herefordshire, situated on the river Wye, 137 miles from London. It has a corporation, consisting of a high steward, bailiff, recorder, and twelve burgesses, and still sends, as before, two members to parliament. The church is a neat and spacious building, adorned with an altar-piece by the celebrated Rubens. The tower of it has a musical peal of eight bells. There was formerly some woollen manufactures, which have disappeared. The chief trade now is in wool and flax, the latter of which grows of excellent quality. The market was formerly held on Thursday, but has been exchanged for Friday by act of parliament. The magistrates of Leominster have an exempt jurisdiction. The population of the borough amounted in 1801 to 3019, in 1811 to 3238, in 1821 to 3651, and in 1831 to 4300; but the whole parish at the last census contained 5249 inhabitants.

LEOBSHUTZ, a city, the capital of a circle of the same name, in Prussian Silesia, situated at the foot of the mountains. It is surrounded with walls, and contains five Catholic churches, an hospital, 530 houses, and 3670 inhabitants employed in making woollens, hosiery, and linen goods.

LEOBEN, a city of Austria, in the circle of Bruch, in the province of Steyermark. It stands on the river Mur, and is the see of a bishop; contains 278 houses, and 2200 inhabitants, who are employed in making iron. It is remarkable for the peace concluded at it in 1798, between Austria and France. Long. 15. 0. 25. E. Lat. 47. 23. 36. N.

LEON, a province, or, as it is more commonly called by the natives, a kingdom, of Spain. Asturias bounds it on the north side, Galicia on the west, Estremadura and Old Castile on the south, and New Castile on the east. Its extent is 1207 square leagues, and the number of its inhabitants is 714,037. It is frequently divided into six departments, those of Leon, Palencia, Valladolid, Tora, and Zamora; but the more recent division into two departments, each clearly defined by the course of the river Duero, is more natural, and less likely to perplex. The two divisions are denominated that of Leon to the north, and that of Salamanca to the south, of the Duero. Of the various rivers that cross Leon, the most considerable is the Pisuerga, in the northern limits, to the eastward of the fountains of the Ebro and Reynosa. This is one of the points of separation which divide those streams that run to the Atlantic, from those which run to the Mediterranean, and is consequently one of the most elevated districts in Spain. From its great elevation, it is necessarily cold; and some of its summits reach the line of perpetual snow. These hills produce the loftiest and best oaks in the peninsula, and are highly useful in the construction of ships. Many bears and some wolves are found in this range of mountains. The principal part of the labour of the mountaineers is directed to the iron mines, and to the manufactory of hardware. In the intervals between the highest hills they have good pastures, and feed many cows, from whose milk butter is made, which, if the natives understood, or rather practised, the simple art of salting, and packing in casks, might become a valuable branch of commerce with the other parts of Spain, which draw their supplies of that commodity from Holland or from Ireland. The mountains which diverge from these towards the west are very steep, and gradually increase in height till they reach the border of Asturias, with which the communication is held by fissures in the mountains called the Puertos de Piedrafita, de Pajares, de Somceda, &c.

The height of these mountains has never been accurately ascertained; but if the various plants that grow on their tops is a certain criterion of their elevation, they are equal to the Pyrenees, and to most of the points of the Alps. The inhabitants of these mountains are a detached race, and are thus described by Don Mariano Lagasca, a recent and very intelligent traveller. "The villages have few inhabitants, and are mostly in the valleys. The inhabitants are robust and simple in their manners; they are equally ignorant of luxury and drunkenness; all are clothed very coarsely, but warmly, from the looms of their own females, and have their garments made in the simplest fashion. Without physician, surgeon, or apothecary; without irregular pleasures, they live happily, drinking the milk of their cows, and eating their barley-bread and salted meat. They have no other bed than a table fixed to the wall at one end of their dwellings, which in shape resembles a coffin. They cultivate a few vegetables, and grow barley in some of the least cold parts of the district, but not sufficient for even their scanty consumption. From June to September they have abundant pasture for their own cattle, as well as for the migratory flocks of merino sheep that pass through their confines. In the valleys they have meadows, on which they make hay for winter food for their cattle. The only industry that is exercised is in making wooden shoes, and bowls and platters of the same substance, which they sell in the neighbouring lower districts. Some are also employed in collecting medicinal plants, which are sold to the city of Leon. Before the year 1803, it was not known that the district abounded in the Iceland moss. Since that period considerable quantities of that substance have been collected, and it is now sold in Madrid at twenty reals the pound, whereas before it was sold at 160. It has begun to form a branch of commerce with the mountaineers, and in time it may become an important article of subsistence for them, as it is for the natives of Iceland."

The river Pisuerga, descending to the plains, receives on the right the river Carrion, and on the left the Arlanza, and passes by Palencia, and through the fertile valley of Tierra de Campos, abounding in wine and oil, till it is joined by the Esgueva near the city of Valladolid, whence it has a short course to the Duero. The other rivers of Leon are the Esla, the Torio, the Bernesga, the Sil, and the Boeza, all of which unite ultimately with the

Duero. On the southern part of Leon, the department of Salamanca, the population is thicker, and the country more fertile. There are some mines of copper, and quarries of marble. Many cows, sheep, horses, and mules, are bred; and, though not a rich, yet, when compared with the mountain districts, it is a fertile tract of land. The principal rivers that water it are the Daraton, the Eresma, the Adaja, the Tormes, and the Agueda, which run to the Duero, and the Alogon, which runs south, and, after crossing part of Estremadura, loses its name in the Tagus.

The different agricultural and commercial productions of the kingdom of Leon will be found under the places in which they are created; and the history of Leon, long a separate kingdom, is included in the general history of Spain. The province of Leon, one of the five in the kingdom, according to the ancient mode of dividing it, is 493 square leagues in extent, and is inhabited by 239,810 people. It contains two cities, 197 towns, and 1284 villages, in 1373 parishes; and has fifty monasteries, and sixteen charitable institutions.

Leon, a city of Spain, in the province of the same name, and capital of it, as it was of the ancient kingdom of Leon before its union with Castile. It is situated on a kind of peninsula, formed by two rivers, the Torio and the Bernesga. It contains a population of about 7000 souls, who are employed principally in spinning thread, and making it into coarse linen. The country around it yields wheat, barley, and particularly flax; and they have meadows where the cattle are pastured, and, what is not usual in Spain, where they make hay. It is the see of a bishop, and, among various public buildings that attract attention, the most remarkable is his cathedral, a most beautiful specimen of the Gothic style of architecture. It contains thirteen parish churches, nine monasteries, four hospitals, 1500 houses, and 6170 inhabitants. Lat. 42. 45. N. The inhabitants make worsted stockings and caps, in forty looms; leather and leathern gloves; and have some tanneries.

Leon, *Peter Cicca de*, author of the history of Peru. He left Spain, his native country, at thirteen years of age, in order to go into America, where he resided seventeen years, and observed so many remarkable things, that he resolved to commit them to writing. The first part of his history was printed at Seville in 1553. He began it 1541, and ended it in 1550. He was at Lima, the capital of the kingdom of Peru, when he gave the finishing stroke to it, and was then thirty-two years of age.

LEONARD, St, a city of France, in the department of the Upper Vienne, and arrondissement of Limoges. It is situated on the Vienne; was formerly surrounded with walls, now converted into pleasing promenades, planted with trees. It contains 410 houses, and 4950 inhabitants, who carry on manufactories of flannels and druggets, make much leather, and some copper ware. Long. 1. 25. E. Lat. 45. 50. N.

LEONARDO da Vinci. See Vinci.

LEONESSA, a city of the kingdom of Naples, in the province Abruzzo Ulteriore. It stands on the river Corno, at the foot of the mountain Triglia. It contains 4719 inhabitants, who have some trade in corn, from living in a frontier town.

LEONIDAS I. king of Sparta, a renowned warrior, slain in defending the straits of Thermopylæ against Xerxes, 480 b. c.

LEONINE, in poetry, is applied to a kind of verses which rhyme at every hemistic, the middle always chiming to the end. The origin of the word is somewhat obscure. Pasquier derives it from one Leoninus or Leonius, who excelled in this species of composition, and dedicated several pieces to Pope Alexander III.; others derive it from Pope Leo, and others from the *lion*, by reason it is the loftiest of all verses.

LEONTICA, feasts or sacrifices celebrated amongst the ancients in honour of the sun. They were called *Leontica*, and the priests who officiated at them *Leones*, because they represented the sun under the figure of a lion radiant, bearing a tiara, and griping in his two fore paws the horns of a bull, which struggled with him in vain to disengage himself. The critics are extremely divided about this feast. Some will conceive it to have been anniversary, and make its return, not in a solar, but in a lunar year; others hold its return more frequent, and give instances where the period was not above two hundred and twenty days. The ceremony was sometimes also called *Mithriaca*, Mithras being the name of the sun amongst the ancient Persians. There was always a man sacrificed at these feasts till the time of Hadrian, who prohibited it by a law. Commodus introduced the custom anew, but after his time it was again exploded.

LEOPARD. See Mammalia.

LEPANTO, a town of Turkey in Europe, the capital of the province Ainabachti. It is situated in a bay celebrated for a victory over the Turkish fleet, by Don Juan, in 1751. It is defended by two forts, and contains a population of 2000 persons, chiefly Greeks, who carry on several tanneries, and other trades. Long. 21. 57. E. Lat. 38. 30. N.

LEPER'S Island, one of the New Hebrides, in the South Pacific Ocean, so called by Monsieur Bougainville, by whom it was visited in 1768. Long. 168. 4. E. Lat. 15. 21. N.

LEPIDOPTERA, in *Zoology*, an order of insects with four wings, which are covered with imbricated scales.

LEPROSY, a cutaneous disease, appearing in dry, white, thin scabs, either on the whole body, or only on parts of it, and usually attended with a violent itching and other pains. The leprosy is of various kinds, but the Jews were particularly subject to that called *Elephantiasis*. Hence the Jewish law excluded lepers from communion with mankind, banishing them into the country or uninhabited places, without excepting even kings. When a leper was cleansed, he came to the city gate, and was there examined by the priests. After this he took two live birds to the temple, and fastened one of them to a wisp of cedar and hysop tied together with a scarlet ribbon; the second bird was killed by the leper, and the blood of it received into a vessel of water; with this water the priest sprinkled the leper, dipping the wisp and the live bird into it. The live bird was then let go; and the leper having undergone this ceremony, was again admitted into society, and to the use of things sacred. (See Levit. xiii. 46, 47; and Levit. xiv. 1, 2, *et seq.*)

LEPTUM, in *Antiquity*, a small piece of money, which, according to some, was only the eighth part of an obolus; but others think it was a silver or brass drachm.

LEPUS, the hare, in *Astronomy*, a constellation of the southern hemisphere, the stars of which in Ptolemy's catalogue are twelve, in that of Tycho's thirteen, and in the Britannic nineteen.

LERIDA, a city of Spain, in the province of Catalonia. It is strongly fortified, and in a situation favourable for defence. It was the brilliant theatre of one of the campaigns of Julius Cæsar, and continued to be a place of military importance down to the war of the succession, when it supported the Austrian family; but, after the battle of Almanza, it submitted to the Bourbons. It is situated near the junction of the river Cinca with the Ebro, in a rich and well-cultivated plain. It is the see of a bishop, has a university, and a strong citadel; four parish churches, sixteen monasteries, one hospital, and 16,818 inhabitants.

LERWICK, the principal, and, indeed, with the exception of Scalloway, a village containing a few scattered cottages, the only town in the Zetland Islands. It is situated

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on the east side of Mainland, the largest island of the group, in latitude 60. north, and longitude 1. west. It consists of one irregular, ill-paved street, with several lanes branching off. The town is of comparatively modern date. Captain Smith, who visited the islands in 1633, describes the harbour, but makes no allusion to any town, which he would have done had it then existed. In 1700, Brand speaks of it as containing between two and three hundred families. A century afterwards, it is described as having a population of about 1000. By the census of 1821 the inhabitants amounted to 2224, and by that of 1831 to 2750. The only public buildings are, the town-house, which unites under one roof the court-room, the prison, the custom-house, and masonic lodge; the parish church; and a dissenting meeting-house. To the south of the town stands Fort-Charlotte, a citadel, first erected during the protectorate, and rebuilt by the second Charles in 1665; but having been burned in 1673 by the Dutch, it lay in ruins till 1781, when it was re-modelled, mounted with twelve guns, and named after the queen of George III. The harbour of Lerwick, called Bressa Sound, is large and most secure, the depth of water varying from five to sixteen fathoms. Two thousand *busses* from Holland, it is asserted, have found accommodation in it during the fishing season; and Sir Robert Sibbald says that, in 1653, the English fleet, consisting of ninety-four men of war, lay some days in the harbour, and that in 1665, another fleet, to the number of ninety-two sail, were there for some time. The only manufactory in Lerwick is one of straw-plait; still there is a considerable trade carried on with Leith and other towns. The exports are chiefly fish, butter, hides, tallow, calf and rabbit skins, stockings, and, till lately, kelp; the imports are, coals, cloths, groceries, and grain, Zetland not producing a sufficient quantity of the last for the consumption of the inhabitants. Few strangers have visited Lerwick without being delighted with the kindness and hospitality of the inhabitants; and all agree in praising the morals and intelligence of the common people. From the statistical returns made to the General Assembly in 1833, by the committee for increasing the means of education and religious instruction in Scotland, it appears that in the parish of Lerwick, containing a population of 3194 (viz. 2750 in the town, and 444 in the landward part of the parish), there are six schools, the parochial, and five on the teachers' own adventure; 201 scholars, of whom sixty-five attend the parochial, and 136 the other schools; and that, of the whole number of scholars, sixty-one are learning Latin, and twenty-five mathematics. The same document states, that all the inhabitants above six years of age are able to read; but this statement must be received with some grains of allowance.

LESBOS, a large island in the Ægean Sea, on the coast of Ætolia, about 168 miles in circumference. It has been successively called *Pelasgia*, from the Pelasgi, by whom it was first peopled; *Macaria*, from Macareus, who settled in it; and *Lesbos*, from the son-in-law and successor of Macareus, who bore the same name. The chief towns of Lesbos were Methymna and Mitylene. It was originally governed by kings, but they were afterwards subjected to the neighbouring powers. The wine which it produced was greatly esteemed by the ancients, and is still held in the same repute amongst the moderns. The Lesbians were so debauched and dissipated, that the epithet of *Lesbian* was often employed to signify debauchery and extravagance. Lesbos has given birth to many illustrious persons, such as Arion, Terpander, Sappho, and others.

LESCAILLE, James, a Dutch poet and printer, was born at Geneva. He and his daughter Catherine Lescaille excelled most of the Dutch poets. But the latter, who was surnamed the Sappho of Holland, and the tenth muse, died in 1711. A collection of her poems has been printed, in which are the tragedies of Genseric Wenceslaus, Herod and Mariamne, Hercules and Dejaneira, Nicomedes, Ariadne, Cassandra, and others. James Lescaille, her father, deserved the poet's crown, with which the Emperor Leopold honoured him in the year 1603. He died about the year 1677, aged sixty-seven.

LESGHISTAN, a territory of the Caucasus, bounded on the north by Circassia, and on the east by Daghestan. It is a stupendous range of mountains running in a south-easterly direction, of great length, but of inconsiderable breadth, and forming the whole north-eastern frontier of Georgia. Dr Reineggs describes this mountainous tract as broken by innumerable and frightful gulfs. These, he says, are united by strong stone or wooden bridges, by roads carried over impracticable rocks; streams are confined to a particular course, and wholesome spring-water is carried everywhere by pipes and canals cut out of the rock. The soil being scanty, and the level ground insufficient to enable the proprietor to raise the means of subsistence, he ingeniously contrives to increase the surface to the very summit of the heights, by graduated terraces, filling the intermediate spaces with rubbish, and covering them with earth. The houses of the inhabitants, seen from a distance, have an awful appearance, being situated on the loftiest summits of the mountain, and on the most frightful precipices. The Lesghaes are the bravest, as they are the most turbulent, of all the nations of the Caucasus, being the terror and scourge of all the neighbouring tribes, whose villages they lay waste, and whose inhabitants they carry into servitude. They are partly Mahommedans and partly idolators, the few tribes who yet remain in ignorance never changing the object of their veneration, which is either the sun, moon, or stars, or any other grand object that has made an impression on their minds. They have from time immemorial maintained their independence, partly by their own valour, and partly owing to the inaccessible nature of their country. They are accustomed to hire themselves out to fight the battles of their neighbours; their pay is twelve roubles the campaign, which must not last above three months. In these wars they often take opposite sides, to which they remain faithful, so that it frequently happens that a Lesghae falls by the hand of his brother or intimate friend. They are lightly dressed, according to the custom of the Tartars; and are armed with a gun, pistols, dagger, and sabre. Their women are distinguished for their beauty, surpassing even the females of Mount Caucasus; and they bring the largest prices in the markets of Constantinople.

LESKARD, a market and borough town of Cornwall, in the hundred of West, 237 miles from London. It was incorporated by Queen Elizabeth, and is governed by a mayor, recorder, and twelve capital burgesses. Upon the hills to the north are many tin mines at work, and the country surrounding feeds many sheep, so that the chief trade consists of tin and wool. The population of the town amounted in 1801 to 1860, in 1811 to 1975, in 1821 to 2423, and in 1831 to 2853; but the whole parish at the last census contained 4042 inhabitants.

LESLEY, John, bishop of Ross, was born on the 29th of September 1527. In an account of his life for which he must himself have supplied the materials, he is said to have been born of honourable parents, and to have been a descendant of the ancient and noble family of Lesley, which then continued to flourish in Scotland. According to another account, which is less vague in its terms, but still disguises the truth, his father was Gavin, a great-grandson of Andrew Lesley of Balquhain,[1] the represen-

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[1] Laurus Leslæana explicata, § 31. Græcii, 1692, fol. "Gavanus, Alexandri quartogenitus, ducta in consortem thori N. N.

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tative of a well-known family in the county of Aberdeen. Knox has clearly stated that he was the son of a priest;[1] and the illegitimacy of his birth is sufficiently ascertained from a dispensation, granted under the authority of a papal bull, and rendering him capable of receiving holy orders;[2] for without such a dispensation, a person of spurious birth was declared incapable by the canon law. In this document, bearing date the 9th of July 1538, he is described as a scholar of the diocese of Moray; and Keith conjectures, with great probability, that he was the son of Gavin Lesley, rector of Kingusie, and likewise, as he supposes, official of that diocese. The bishop's father is described as an eminent lawyer; and a knowledge of the canon law was indispensable in a person who held this judicial situation.

Lesley prosecuted his studies in King's College, Aberdeen, where he took the degree of A. M. Keith mentions a deed by the bishop of Aberdeen, promoting him, a "clerk of his diocese, to the character of an acolyte in his cathedral church, dated 15th June 1546." This statement is scarcely intelligible: the character of an acolyte, which cannot well be described as promotion, is that of an individual who has been admitted to one of the lower orders in the Romish church; the seven orders being those of porter, lector, exorcist, acolyte, subdeacon, deacon, and priest. In the twentieth year of his age, he became a canon of the cathedral churches of Aberdeen and Elgin. It was apparently this improvement in his circumstances that enabled him to obtain the most liberal education which was then to be procured. Having spent some time in Paris, where he directed his attention to the study of divinity and languages, especially the Greek and Hebrew, he proceeded to the university of Poitiers, and there applied himself to the study of the civil and canon laws for the space of nearly four years. He afterwards resided about a year at Toulouse, where he took the degree of licentiate of the civil law; and having returned to Paris, and taken the degree of LL. D. he continued for nearly another year to read lectures on the canon law. With these proofs of his academical attainments, he returned to his native country in the month of April 1554, and successively obtained many different preferments, secular as well as ecclesiastical. He was appointed professor of the canon law in the university of Aberdeen;[3] and on the 18th of April 1558, Bishop Gordon, with the dean and chapter, granted a commission, nominating him official of that diocese. The commission describes him as parson of Oyne and Morthlack, prebendary and canon of the cathedral church of Aberdeen; but a subsequent document, dated on the 2d of July 1559, relates to his induction and investiture in the parsonage, canonry, and prebend of Oyne, stall in the choir, and place in the chapter. "I did accept the office judicator of the dioces of Aberdene," he remarks, "where in I travelled ten yeres, and how I did behave my selfe therein, I report my selfe to the testimonie of the country; for besids the ministratioun of justice in mine owne office, I assisted the sheriffe of the shire with my counsell for execution of justice according to the lawes, and imployed alsoe other whyles great travells in compoundinge and agreeinge of differences betwixt parties, proceedinge either of deadly feads, or other debates for lands or goods, which is the right office of a judge, as saith the jurisconsult."[4]

The protestant religion had now obtained a stable footing in Scotland; and the Book of Discipline was presented to a convention of estates held at Edinburgh in the month of January 1561. Several of the papists had been summoned to give an account of their faith; and among these was the official of Aberdeen, together with Patrick Myrtom, treasurer, James Strahan, a canon of the cathedral, and Alexander Anderson, sub-principal of King's College. The disputants on the other side were Knox, Willock, and Goodman, whom we may easily suppose to have been an over-match for the theologians of Aberdeen. Of this disputation Lesley and Knox have each given an account, nor is it easy to reconcile their statements with each other. According to one of them, the four respondents made a very firm profession of the catholic faith; and of the sacrifice of the mass Anderson gave so able an exposition, that the heretics evinced no further inclination to dispute, either with him or any other catholic, concerning the high mysteries of the true religion. According to the other account, the sub-principal made a very lame defence of his opinions, and finally declined to continue the disputation, admitting "that he was better sein in philosophy then theology." Lesley was then required to answer the former arguments against the mass; "and he with gravity began to answer, If our master have nothing to say to it, I have nothing; for I knaw nothing bot the canone law; and the grittest ressoun that ever I culd find thare is *Nolumus & Volumus*." The historian of the reformation subjoins, "the nobility hearing that neyther the ane nor the uther wald answer directly, said, We have bene miserably deceaved heirtofor; for if the mess may not obtean remissioun of sines to the quick and the dead, quharefore war all the abbacies so richly dotit with our temporall lands?"[5] The other historian has stated that he and his associates were subjected to the punishment of being compelled to remain in Edinburgh, and listen to the sermons of the ministers.[6] From this statement, which is by no means incredible, there is a material departure in the biography to which we have already referred. "Upon this, the sectarian nobility were, by the instigation of the heretical ministers, so much incensed against Dr Lesley, and the doctors his associates, that they were taken into custody, and put in the prison of Edinburgh, the chief city of Scotland, where, after confinement for some time, they found sureties, who were bound in a very great penalty, that they should make their appearance, in order to their trial, whenever they should be required: upon which they were at length set at liberty, and returned to Aberdeen." This biographical tract was obviously intended to exalt the subject of it to the character of a great confessor and sufferer for the catholic faith; and some of its statements are apparently to be received with a certain degree of caution, if not suspicion.

On the death of Francis the Second, the leaders of the protestant party sent the prior of St Andrews to France, with the view of preparing the mind of the young queen for a favourable consideration of their cause. In order to

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suscepit ex ea Joannem episcopum Rossensem." There is evidently a studied ambiguity in the expression. Mr Riddell mentions that the parson of Oyne was summoned as one of the nearest of kin to "Andrew Lesslie, son to the deceased William Lesslie of New-Lesslie, a pupil." (Remarks upon Scotch Peerage Law, p. 205. Edinb. 1833, 8vo.)

[1] Knox's Historie of the Reformatioun of Religioun, p. 262. edit. Edinb. 1732, fol.

[2] Keith's Catalogue of the Scottish Bishops, p. 198. Russell's edit. From the originals belonging to the family of Balquhain, this industrious writer has given the substance of twelve documents which reflect much light on the bishop's personal history.

[3] Orem's description of King's College, Aberdeen, p. 156.

[4] Lesley's Negotiations, p. 7.

[5] Knox's Historie of the Reformatioun of Religioun, p. 262.

[6] Leslæus de Rebus gestis Scotorum, p. 574.

counteract this influence, Lesley was despatched on a similar mission by the popish earls of Huntley, Crawford, Athole, Sutherland, and Caithness, the archbishop of St Andrews, the bishops of Aberdeen, Moray, and Ross. He found Mary at Vitri in Champagne on the 15th of April 1561, and earnestly recommended to her care and protection the interests of the tottering church: he appears at the same time to have recommended himself very effectually to her good graces. She did not however adopt his desperate scheme of landing at Aberdeen, and endeavouring to raise an army for the purpose of restoring the catholic faith. He attended the queen on her return to Scotland, where she landed on the 21st of August. On the 14th of January 1564 he was admitted an ordinary judge of the court of session. If we may rely on the authority of the tract already quoted, he became president of that court, but this statement is not supported by the records: in the absence of the president, he may occasionally have filled his chair, and this is perhaps the only charitable construction which such an averment will easily admit. The queen likewise nominated him a member of the privy council, and bestowed upon him the abbacy of Lindores, which he was allowed to hold *in commendam*. The bishopric of Ross becoming vacant by the death of Henry Sinclair on the 2d of January 1565, she secured to him this higher preferment, and the necessary bulls were procured from the pope.

In the year 1566 the queen issued, under the great seal, a commission to certain noblemen, prelates, and lawyers, granting to them, or any six of their number, full power and authority to revise and publish the laws of the realm. They were to commence with the books called *Regiam Majestatem* and *Quoniam Attachiamenta*, and were to descend according to the order of chronology; but the only apparent fruit of their labours was a publication of the acts of parliament, from the reign of James the First. These were printed under the superintendence of the learned civilian, Dr Henryson, one of the commissioners; and in his preface he has particularly commended "ane Reuerend Father in God, Johne Bischop of Ros, Lord of our Soueranis Secreit Counsall, and of hir College of Justice, for his suggestioun to our Souerane of this notabill purpose, eirnistfull performing of the said commissioun, and cure in conuening of my Lordis Commissaris his colligis, and liberalitie in the furthsetting of this imprenting."[1]

To the fortunes of the queen Lesley adhered with unshaken fidelity; and as her career was marked by many actions which set virtue and decency at defiance, his employment as a privy counsellor could not always be very suitable to his character as a churchman. He is supposed to have been the individual who suggested an expedient for granting to the earl of Bothwell an indirect pardon for the murder of the king;[2] a crime to which there is the strongest moral evidence that the queen was an accessory, before as well as after the fact. On the 24th of April 1567 the earl seized her person, and conducted her as a prisoner to the castle of Dunbar. This act of apparent violence, which at first seemed to be so unnecessary, had evidently been devised with her entire approbation. The ultimate object of such an expedient did not long remain doubtful: in the course of a few days, she granted him a pardon for this treasonable act, and for all other crimes with which he could be charged. By a general clause, inserted in the common form, she pardoned the murder of her own husband, and yet avoided the scandal of mentioning it in direct terms. She soon afterwards created her paramour duke of Orkney; and having hastily procured a divorce from his wife, his infamous nuptials with the queen were celebrated on the 15th of May, about three months after he had assassinated her former husband. The measure of her guilt and folly was now full. She was committed to custody in the castle of Lochleven on the 15th of June, and was finally divested of the royal authority. On the 2d of May 1568 she escaped from her prison, and soon afterwards found herself at the head of a considerable army. The bishop of Ross had retired to his diocese, and, according to his own account, was there employing his time in contemplation and study, and in giving counsel to friends and others committed to his charge, when the queen sent him a message requiring his immediate attendance at Hamilton. In company with certain noblemen, whose names he does not mention, he accordingly hastened to obey this summons; but before his arrival her forces had been completely dispersed at the battle of Langside, and she had found it necessary to consult her safety by proceeding towards the borders of the two kingdoms. In an evil hour, she entered the English territory; for she speedily discovered that she had reposed her confidence in a cruel and unrelenting rival, whom neither the common ties of blood, nor the sympathy due from one sovereign princess to another who had fallen from her high estate, had any tendency to move with feelings of generosity or even of compassion.

Τὰς φρένας διέφθορε
Θνητῶν, ὅσοισιν ἁνδάνει, μοναρχία.

Mary again required the services of the bishop, and in the month of September he waited upon her at Bolton castle. Lesley acted as one of her commissioners during the conferences which opened at York on the 4th of October, and in the course of the ensuing month were continued at Westminster. After many debates, which were very ably maintained on both sides, this commission terminated without any immediate result. In February 1569 he proceeded to Tutbury castle, where the queen was detained under the custody of the earl of Shrewsbury; but on some suspicion of having concerted a plan to effect her escape, both he and Lord Boyd were soon afterwards retained in ward at Burton upon Trent, and were not released till after an interval of nearly three months. The bishop was now employed in the capacity of an ambassador to the queen of England, and he acquitted himself with great zeal and ability, but not with corresponding success. He was instructed "to sue earnestly that the queen his mistres might be put to libertie, and restored to her crowne and realme; and to that effect to make such reasonable offers to the queen of England, as might fully satisfie her for anie speciall debate or contraversie that had hapned betwixt their majesties, touchinge the title of the crowne of England, and to assure that shee would alsoe shew her clemencie toward her subiects in Scotland whoe had offended her." His instructions embraced other particulars; and he was specially enjoined to acquaint the French and Spanish ambassadors with his proceedings, and to ask their advice in all matters connected with his mission. In the mean time, his pecuniary resources were somewhat scanty and precarious. A messenger brought me advertisement, he informs us, that the earl of Moray "had taken my house of Rosse from my servants, and medled with my whole benefices, and all that I had in Scotland, and had sayd to my freinds that he would cause me to leave my ambassade for povertie; which he intended should take effect, for he putt Androwe Monrowe his servaunt in my house at Rosse, whoe had spoiled it before, and slaine some of my servaunts in it, since my cominge into England, albeit it was recovered shortely by my friends in my absence from him at that time: but nowe he hath withholden the same, and taken up my whole fruicts continually since that time. And farther the erle would not suffer anie of my friends or merchants to make me anie furnyshinge; and he did well forsee that the queen my mistres might not support her owne necessitie, nor yet my chargs, at that time a great strayte; for he toke up her whole rents in Scotland, and the prince of Condies armie was lieinge then at Poicters and Toures, where the moste parte of her dowrie in Fraunce consists, and by that meanes shee could gett none of it, soe that truely wee were driven to a great strayte." In the midst of these perplexities, he applied to the French ambassador, who was unable to afford him any relief. Mary then wrote to the duke of Alva; and, on his responsibility, the Spanish ambassador furnished him with a thousand crowns, one portion of which he remitted to the queen, another to the garrison of Dunbarton castle, and the residue he retained for the expenses of the embassy; nor did he obtain any further supply during his residence at the court of England.

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[1] The Actis and Constitutiounis of the Realme of Scotland. Edinb. 1566, fol.—In 1567 the bishops of Aberdeen and Ross acted as curators of the younger children of George fourth earl of Huntley, when they concurred in the proceedings for obtaining a reversal of their father's attainder. (Acts of the Parliaments of Scotland, vol. ii. p. 572.)

[2] Buchanani Rerum Scoticarum Historia, lib. xviii. p. 356. edit. Ruddiman.

The scheme of a marriage between Mary and the duke of Norfolk involved many of their adherents in danger and difficulties. The duke was himself committed to the Tower, and several other men of rank were detained in custody. Lesley was repeatedly examined before the English queen and council, and was confronted with the earl of Leicester, who had likewise been implicated in the same transaction. The earls of Northumberland and Westmoreland had recourse to arms, but were not long able to keep the field: a force having been sent against them, they suddenly retired into Scotland, in the month of December 1569. The former of these noblemen having entered Liddaldale, was seized by a band of freebooters, and delivered into the hands of the earl of Moray, who detained him as a prisoner in Lochleven castle. A short time before his assassination, the regent intimated to the ministers of Elizabeth that the earl of Northumberland, and other Englishmen then in Scotland, had mentioned the bishop of Ross as having been cognizant of their designs, and having encouraged them by the promise of obtaining money from foreign princes. In consequence of this information, he was placed under arrest, and was detained in custody for six weeks before he was subjected to any examination. In March 1570 he was brought before the council at Hampton Court, and confidently denied the charge; but what is directly denied in the account of his Negotiations, is virtually admitted in the narrative of his life. He did not recover his liberty till after a further detention of two months, and he was speedily involved in fresh troubles. Ridolfi, a papal emissary, was employed in conducting certain negociations between the Scottish queen, the duke of Norfolk, and the duke of Alva. At Brussels he had entrusted Charles Baily, a Flemish servant of the queen's, with a packet of letters addressed to Mary herself, to Norfolk, Lesley, the Spanish ambassador, and Lord Lumley. Instead of obeying the bishop's injunctions, by leaving the packet with the captain of Calais, this messenger retained it in his own possession; and having been searched at Dover, all his papers and books were seized, and he was himself committed to the Marshelsea. Among the books were some copies of the bishop's defence of Mary's honour, and her right of succession to the crown of England. By means of Lord Cobham, warden of the Cinque Ports, he had sufficient influence and dexterity to obtain possession of the most material letters, and having "others made to their quantitie and similitude," these were transmitted to the council. Of this substitution he contrived to make the prisoner duly aware, in order to allay his fears, and to prevent him from making any dangerous disclosures; for his alarm had been so great that he plainly declared he was the bearer of letters which would cause himself and many others to be hanged. Being now recovered from his agitation, he refused to divulge any material fact on his first examination; but on being sent to the Tower, and placed upon the rack, he avoided the torture by a full confession of his transactions with Ridolfi, and by a statement of the letters having been conveyed to the bishop of Ross. Of this confession the bishop obtained secret intelligence, and he lost no time in preparing himself against its consequences. Only one individual, John Cuthbert, his chief secretary, was acquainted with his ciphers and secret writings: he was immediately sent to a place of safety, and after being concealed four months in London, was secretly conveyed to France. The ambassador took care that no dangerous papers should be found in the search which he now anticipated. In the mean time, his labours, anxieties, and disappointments had severely affected his health, though for the last thirty years he had not been visited with any sickness. For nearly three months he was afflicted with a fever or ague, and was attended by two of the best physicians in London. On the 13th of May 1571, while his malady was still unabated, four members of the council, the earl of Sussex, Lord Burleigh, Sir Walter Mildmay, and Sir Ralph Sadler, came to his residence, and began to interrogate him respecting the facts disclosed by the intercepted messenger. He averred that he was accountable to his royal mistress, and would not admit any other responsibility. They did not fail to enquire for Cuthbert, but found that he could not be traced. They then removed all his servants, except two who were left to attend him during his illness; and two gentlemen of good credit, named Shipworth and Kingsmill, were appointed to remain with their own servants in charge of the ambassador and his house. His papers were carefully examined, and his study was locked and sealed. On the following day, afflicted as he was, he was conveyed in a chariot of the queen's to Ely House in Holburn, and was there committed to the keeping of the two gentlemen already mentioned, and of the bishop of Ely's own retinue. When his health was somewhat restored, he was on five different occasions examined before the privy council. The key of his study was at length restored to him; and on the 17th of August he was commanded to accompany the bishop to the country, being permitted to retain five of his own servants, who were to attend their master wherever the English prelate should travel or reside.

The duke of Norfolk, after having been set at liberty, was a second time committed to the Tower; and the investigation of his alleged acts of treason led to further discoveries respecting the bishop of Ross's participation in his designs. An order was despatched to the Isle of Ely, directing Bishop Cox to send his prisoner to London. There he accordingly arrived on the 19th of October, and was first detained in the house of the lord mayor. Several members of the council, the earl of Bedford, the lord admiral, Lord Burleigh, Sir Francis Knowles, and Sir Thomas Smith, accompanied by the attorney and solicitor general, came to interrogate him on the twenty-fourth of that month, and treated him with the utmost harshness, threatening him with the rack and the gallows. He pleaded the privileges of an ambassador, and, producing the queen of England's safeconduct, appealed to his royal mistress as the only competent judge of his conduct dur-

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ing his embassy. He was nevertheless sent to the Tower, where he appears to have been treated with great and unnecessary rigour. "At my entry into the Towre," he states, "I was received by the leivetenant, and placed in a prison called the bloudie towre, a very evill ayred and infected house (where noe man of honest callinge had bin kepid manic yeres before) with close windowes and dores with manie locks and bolts, which was torment sufficient enough for any livinge man that had bin all his daies at libertie, with a cockshott, as they call it, sett up without, right against my windowe, to keepe all light and sight from me. And at my first entres I was searched in all parts, and such paper and inke, as was in my companie, taken from me, which was another greife. And in this manner I was straytly and closely kept, and noe man had recourse unto me, but onely the leivetenant himselfe, duringe the whole time I was a prisoner." Of his subsequent treatment, of his different examinations, and of the various attempts to draw from him information which might either criminate himself or others, he has given a circumstantial and interesting detail in his Negotiations.

Dr Wilson, master of the requests, was sent to him for the purpose of inducing him to become a witness against the duke of Norfolk, and to deliver certain letters which he had himself received from Ridolfi and others, and which were to be produced in evidence at the trial; but the bishop again relied upon his character as an ambassador, and, according to his own statement, refused either to appear as a witness, or in any other way to furnish information which might tend to the prejudice of any individual. This unfortunate nobleman was convicted of high treason on the 16th of January, and was brought to the scaffold on the 2d of June, 1572. The rules of evidence were at that period little understood, and less regarded, nor was it necessary to produce the witnesses in court, provided there was any other method of rendering their depositions available: previous answers to interrogatories, the declarations or admissions of the prisoner or other individuals, were all received as the most legitimate evidence; and in fact the trial of the duke of Norfolk before his peers, was entirely conducted without the aid of parole testimony. The bishop of Ross, whose name was perpetually mentioned in the course of the proceedings, may be considered as the principal witness against him; for of all the most material charges the proof seems in a great measure to have rested on what are described as the bishop's confessions, that is, the answers emitted during his repeated examinations after he had himself been taken into custody.[1] On perceiving that all their designs were discovered, Lesley had become more communicative, and had thus contributed to the ruin of a man whom he had so much contributed to entangle in dangerous schemes of ambition.

While he was beset with such perils in England, the regent sent Nicholas Elphinstone with a demand that he should be conveyed to Scotland; a demand which he considered as a sufficient indication of the treatment that awaited him in his native country. But the duke of Montmorency having arrived from France on a special mission, brought instructions from the king to intercede for his release; and this application was so far successful as to procure his removal to Farnham castle, the seat of the bishop of Winchester. The lieutenant of the Tower charged for his maintenance the sum of two hundred pounds, which was advanced by the French ambassador, and repaid by Mary: he likewise retained as a lawful perquisite the whole of the furniture and silver plate which the prisoner had brought for his own use; and finally, says Lesley, "the gentleman-porter of the Tower retained my satin gown as due to him, because it was my uppermost cloth when I entred." Being only permitted to take one attendant, he selected Thomas Lesley, a secretary who had resided with him during his captivity, and had himself been subjected to a short imprisonment. In the castle of this prelate, Dr Horne, he has stated, "I remained the space of a year and three moneths, and all that time was very straitly keept, and two gentlemen did continually wait upon me night and day, and had no liberty to speake to any other his servants but in their presence, nor yet with any other but in my Lord of Winchesters own presence; yet in all other things I was very honourably and friendly used by him."

During his confinement in the Tower, he had sought for consolation in study and meditation. There he had composed his *Piæ Consolationes;* and he was now permitted to transmit them to the queen, who needed consolation still more than her ambassador. From this pious treatise she derived so much gratification, that she devoted some of her prison hours to the task of transfusing a portion of it into French verse. He was induced to prepare a similar work, *Animi tranquilli Munimentum,* which he sent to her on the 1st of October 1573, and had again the satisfaction of finding that his labours were duly appreciated. In the mean time, he was not free from the apprehension of personal danger; the earl of Morton having twice sent a diplomatic agent, Captain Cockburn, for the purpose of renewing the demand for the delivery of his person. Having some reliance upon his own eloquence, he now addressed to Elizabeth a Latin oration for the recovery of his liberty; and, whatever might be the effect of his classical pleading, he was soon afterwards released from his tedious confinement. The bishop of Winchester, on receiving the necessary order, conducted him to London on the 11th of November. On the sixteenth, he was brought before the council, at the house of the lord treasurer, and was informed that he would be permitted to proceed either to Scotland or France. That Lesley had been deeply implicated in transactions which would justly have exposed a subject to punishment, there seems little or no reason to dispute: the state-papers, as well as the histories of that period, exhibit him in the light of a subtle, restless, and dangerous plotter, who resorted to a great variety of expedients for promoting the interest of the unfortunate queen. The English statesmen seem to have been much inclined to treat him as they ultimately treated Mary herself; and in 1571 they had submitted his case to the opinion of five learned civilians, Lewis, Dale, Drury, Aubrey, and Jones.[2] In answer to one of the questions propounded, they declared, that, according to the law of nations, as well as the civil law, an ambassador who excites rebellion against the sovereign to whom he is sent, forfeits all his privileges, and may be subjected to punishment. But among the more civilized nations it has very generally been regarded as the safest maxim, rather to spare a delinquent than not to spare an ambassador;[3] and although he was thus subjected to a long and arbitrary imprisonment, the ministers of Elizabeth had never ventured to bring him to a formal trial.[4]

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[1] Brown's Tryal of Thomas Duke of Norfolk by his Peers. Lond. 1709, 8vo.

[2] Camdeni Annales, vol. ii. p. 237. edit. Hearnii.

[3] "Levius eorum peccatum fore," says Cicero, "si homini scelerato pepercissent, quam si legato non pepercissent."

[4] Grotius de Jure Belli ac Pacis, lib. ii. cap. xviii. § iv. 5. Bynkershoek de Foro Legatorum, cap. xviii. p. 533. Wicquefort, l'Ambassadeur et ses Fonctions, part. i. p. 559. All these writers refer to the case of Lesley, but Grotius in a more cursory manner, in one of his notes.

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In the month of January 1574 he landed in France, and there he remained till the following year, when Mary thought it expedient to send him on a mission to Rome. He experienced a very gracious reception from Gregory the Thirteenth, who in a great measure defrayed his expenses during the three years of his residence in that holy city. Besides the release of the queen from captivity, her ambassador's instructions related to various other matters, connected with her joint interest and that of the popish faith. The great object to be attained was her restoration to the throne; and with the view of removing some of the obstacles, she was willing to admit her son to a participation of the royal dignity; but in order to render him worthy of being thus associated, some scheme was to be devised for conveying him to a catholic country, and uniting him in marriage either with a daughter of the emperor of Germany or the king of Spain.

Lesley was more usefully employed in preparing for the press his general history of Scotland, which was published at Rome in the year 1578. It is dedicated to the pope, and the epistle dedicatory is followed by an address to Cardinal Cajetano, described as protector of the Scotish nation. Among the commendatory verses inserted in the volume, we find the contributions of Muretus, Ninian Winzet, and Alexander Seton, afterwards earl of Dunfermline, and chancellor of Scotland.[1] These elegant studies of the author were speedily interrupted by a new mission. Hopes were now entertained that the ancient faith might be restored in Scotland by the power and influence of the earl of Athole; and with the view of watching any favourable change of affairs, the pope directed the bishop of Ross to proceed towards the coast of France adjacent to Britain. His holiness having appointed him to supply the place of a nuncio who had recently died at the imperial court, Lesley travelled through Germany, and remained for some time at Prague, where Maximilian was then residing. His instructions from Mary partly related to the Scotish monasteries founded in Germany; some of which having been seized by heretics and other evil disposed persons, he exerted his influence to procure their restoration to the Scotish monks. Monastic institutions have often been the strongholds of political, as well as moral misrule; nor is it difficult to discern the spirit which dictated this ambassador's instructions. He visited the duke of Bavaria, and other catholic princes of the empire, and was every where well received till he arrived at Falsburg, a town near Strasburg, where he was seized by some officers with a guard of four hundred men, under the command of a protestant nobleman, George Cassimir of Littelsteyn. For the space of nearly two months, he was detained in the castle of Falsburg; but they at length discovered their mistake in supposing him to be the archbishop of Rossana, a papal legate; and on paying a considerable sum of money, he was permitted to prosecute his journey. Passing through Lorraine, he arrived in France, and had there the mortification to receive intelligence of the earl of Athole's sudden death, which took place on the 24th of April 1579. It was some consolation that the Cardinal de Bourbon, archbishop of Rouen, soon afterwards appointed him suffragan and vicar general of that diocese. In this station he continued for the space of fourteen years. The kingdom was then devastated by civil war, and he naturally adhered to the party of the leaguers, who, with the view of excluding Henry of Navarre, proclaimed the old cardinal king in the year 1589. While visiting this diocese in the course of the following year, Lesley was intercepted and cast into prison; and in order to pay a ransom of nearly three thousand pistoles, he was under the necessity of selling his furniture and other goods. The city of Rouen was invested in 1591, and during the siege he is said to have exerted himself with great perseverance and resolution in encouraging the governor, officers, and citizens. As a reward of his services, the duke of Mayenne recommended him to Clement the Eighth as well qualified to fill the vacant bishopric of Coustance in Normandy. The pope issued the necessary bulls, accompanied with an unavailing licence to retain the see of Ross till he should be put in possession of his new diocese; and he was graciously pleased to remit the annats, or first fruits, and other payments which usually attend a bishop's promotion. As he could not safely present himself at his episcopal seat, the ceremony of his admission was in the year 1594 performed in the metropolitan church of Rouen.

But from this preferment he appears to have derived no advantage; and the unhappy situation of public affairs in France induced him to seek another place of refuge. Directing his course towards Flanders, he reached Château d'Aussy in the province of Artois, in the month of March, and afterwards proceeded to Brussels, where he experienced a friendly reception from the archduke Ernest, governor of the Netherlands. Of the history of Scotland, he had at an earlier period transmitted a copy to his catholic majesty, who testified its gracious reception by a letter, written in Latin, and bearing the royal signature. On this occasion he had promised to be mindful of the bishop's private affairs. On the day before her execution, Mary had addressed to Philip a letter in which she recommended her son to his special protection; and she likewise requested him to bear in remembrance the faithful services which had been rendered to her by the bishop of Ross. He directed the prince of Parma, then governor of the Netherlands, to bestow upon him the first bishopric or other prelacy that should become vacant in these provinces, and in the mean time to provide for him a suitable maintenance. The prince had accordingly assigned to him a pension of fifty crowns a month, to be computed from the first of June 1587; and this pension still continued to be paid, though not with sufficient regularity to prevent him from being exposed to occasional difficulties. The archbishopric of Mechlin having become vacant, the archduke and the council of state recommended him to Philip for this high preferment; but the design seems to have been frustrated, partly by the unexpected demise of Ernest, who, almost in the article of death, signified to the council his wish that Lesley's suit should not be neglected. He was encouraged by the nobility and counsellors to await the arrival of the new governor, Cardinal Albert, another archduke of Austria, brother to the deceased; and in order to smooth the path of preferment, he prepared a congratulation, which was not however published till after the death of the author. Part of the summer of 1595 he spent at Spa for the benefit of his declining health, and, as we are informed, "not without great inconvenience, and even the danger of his life, by the incursions of the hereticks and the rebels of Holland; who crowding in those parts, robbed him of all his goods, and endeavoured to seize his person, that they might carry it off." But all his personal dangers, as well as his schemes of ambition, were terminated at Brussels on the 31st of May 1596, when he died in the sixty-ninth year of his age.[2]

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[1] An epigram in commendation of Lesley occurs among the poems of Joannes Gesseus, in the Delitiæ Poetarum Gallorum, tom. i. p. 934.

[2] Dodd has recorded his pious benefactions to the church. "He laid the foundation of three colleges for the education of cler-

Bishop Lesley was evidently a man of very superior talents for literature as well as business. His studies and pursuits had been those of a lawyer and statesman, rather than a theologian; and his intellect had been much exercised and whetted by a long course of diplomatic services, of a peculiarly delicate and dangerous nature. With the accomplishments of an elegant scholar, he united the dexterity of a man of the world. He is the author of various works, and several of these must still be considered as valuable. His defence of Queen Mary's honour is written with no small acuteness and address: the task which he had undertaken was sufficiently formidable; if the queen was not guilty of adultery and murder, her conduct had at least exhibited the strongest indications of guilt; but this zealous and able champion shrinks from no difficulties, and is undismayed by the most prominent obstacles. His negociations contain some characteristic details, and furnish some curious materials for history. But the most conspicuous of his works is his Latin history of Scotland, which is written with a very considerable degree of elegance, and, in the more recent portion of it, supplies much important information. The work is divided into ten books; of which the first seven, ending with the reign of James the First, comprehend little more than an abridgement of Boyce. As he descends to his own times, he becomes much more copious and interesting. With the transactions of Mary's reign, which he has not however prosecuted beyond the year 1562, he had peculiar opportunities of becoming familiarly acquainted; and it is useful, as well as interesting, to compare the statements and reflections of Lesley and Buchanan, the most distinguished adherents of the popish and protestant parties.

Of the works of Lesley we subjoin a catalogue, accompanied with a few notices, chiefly bibliographical.

1. A Defence of the Honour of the right highe, mightye, and noble Princesse Marie, Queene of Scotlande, and Dowager of France; with a Declaration aswell of her Right, Title, and Intereste to the Successioun of the Crowne of Englande, as that the Regimente of Women ys conformable to the Lawe of God and Nature. Imprinted at London in Flete Strete at the signe of Iustice Royall against the Blacke Bell by Eusebius Dicæophilus, anno Dom. 1569, 8vo. A Treatise concerning the Defence of the Honovr, &c. Made by Morgan Philippes, Bachelar of Diuinitie, an. 1570. Leodii, apud Gualterum Morberium, 1571, 8vo. Here the tract relating to the succession bears the following title: "A Treatise tovching the Right, Title, and Interest of the mightie and noble Princesse Marie, Queene of Scotland, to the Succession of the Croune of England. Made by Morgan Philippes, Bachelar of Diuinitie, assisted with the aduise of Antonie Broune, Knight, one of the Iustices of the Common Place. An. 1567." This treatise he afterwards translated into Latin, as well as French, and likewise published the original in a separate form. "De Titulo et Jure serenissimæ Principis Mariæ Scotorum Reginæ, quo Regni Angliæ Successionem sibi juste vendicat, Libellus," &c. Rhemis, 1580, 4to. "A Treatise towching the Right, Title, and Interest," &c. *An.* 1584, 8vo. "Du Droict et Tiltre de la serenissime Princesse, Marie Royne d'Escosse, et de tres illustre Prince Iacques VI. Roy d'Escosse son fils, à la Succession du Royaume d'Angleterre: avec la Genealogie des Roys d'Angleterre ayans regné depuis cinq cens ans. Premierement composé en Latin et Anglois, par R. P. en Dieu M. Iean de Lesselie, Euesque de Rosse, Escossois, lors qu'il estoit Ambassadeur en Angleterre pour sa Majesté, et nouuellement mis en François par le mesme Autheur." Rouen, 1587, 8vo. The same work was also translated into Spanish, under the title of "Declaracion del Titulo y Derecho que la serenissima Princesa Doña Maria Reina de Escosia tiene a la Sucesion de Inglaterra."[1] The defence of the queen's honour, from the edition of 1571, is reprinted in Anderson's Collections, vol. i. and the Latin version of the tract on the right of succession in those of Jebb, "De Vita et Rebus gestis Mariae Scotorum Reginae Autores sedecim," tom. i. Lond. 1725, 2 tom. fol. Of his tract on female government he also published a Latin translation. "De illustrium Foeminarum in Repub. administranda, ac ferendis Legibus, Authoritate, Libellus," &c. Rhemis, 1580, 4to. This tract was occasioned by Knox's "First Blast of the Trumpet against the monstrvovs Regiment of Women," published in 1558. His vindication of the queen's right of succession was written in answer to a book published in 1560 by John Hales, clerk of the hanaper. Lesley writes in the character of an Englishman, and therefore borrows the name of Morgan Philips, who was a popish priest of Douay. In order to maintain his assumed character with more propriety, he submitted the manuscript to his friend and physician Dr Good, "that he might turn into English any Scottish words in it."[2]

2. Joannis Leslæi Scoti, Episcopi Rossen. pro Libertate impetranda, Oratio, ad serenissimam Elizabetham Angliæ Reginam. Parisiis, 1574, 8vo. This oration is reprinted in Nichols's "Progresses of Queen Elizabeth," vol. iii.

3. Joannis Leslæi Scoti, Episcopi Rossen. libri duo: quorum uno, Piæ afflicti Animi Consolationes, divinaque Remedia; altero, Animi tranquilli Munimentum et Conservatio, continentur. Ad serenissiman Principem D. Mariam Scotorum Reginam. His adjecimus ejusdem Principis Epistolam ad Rossensem Episcopum, et Versus item Gallicos Latino carmine translatos, pias etiam aliquot Preces, &c. Parisiis, 1574, 8vo.

4. De Origine, Moribus, et Rebus gestis Scotorum libri decem: e quibus septem veterum Scotorum res in primis memorabiles contractius, reliqui vero tres posteriorum regum ad nostra tempora historiam, quæ hucusque desiderabatur, fusius explicant. Accessit nova et accurata Regionum et Insularum Scotiæ, cum vera ejusdem tabula topographica, Descriptio. Authore Joanne Leslæo, Scoto, Episcopo Rossensi. Romæ, 1578, 4to. Nunc denuo recus. anno Domini 1675, 4to. This latter edition, which is said to have been printed in London, contains a dedication to the earl of Rothes, subscribed by a George Lesley. That portion of the history which relates to the reign of Mary, is inserted in the collection of Dr Jebb, tom. i.

5. Congratulatio serenissimo Principi et illustrissimo Cardinali Alberto Archiduci Austriæ, &c. de fausto ac felici

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gymen, to be sent upon the mission, after the example of Dr Allen, as I find by letters between them upon that subject. Having compleated the establishment of a college for his countrymen in Paris, he gave a beginning to another at Rome, with a subsistence for about ten students; where the Jesuits stept in to be managers. This zealous bishop died in the year 1596, leaving behind him a sum of money towards the foundation of a third college, also for the clergy. The design could not be brought to bear till 1609, when a small community was set up at Antwerp, whereof the Jesuits were made superiors. But before matters could be entirely compleated, it was removed to Doway *an.* 1612, and governed by Walloon Jesuits, till one Curle (son to Mr Curle, formerly secretary to Mary queen of Scots) becoming a Jesuit, and bringing with him an addition of 5000 florins to the original stock, he was made rector of the college about 1620. Since that time the superior has been a Scotch Jesuit. Very few clergymen were educated there afterwards, and of latter years none at all; the old fund, as may be supposed, being swallowed up by the latter addition." (Church History of England, from the year 1500 to the year 1688, vol. ii. p. 42. Brussels, 1737-42, 3 vols. fol.)

[1] Antonii Bibliotheca Hispana, tom. ii. p. 354.

[2] Anderson's pref. to Lesley's Defence, p. xi.

ejus Adventu ad Regimen Provinciarum Inferioris Germaniæ. Per R. in Christo P. Joan. Leslæum, Episcopum Rossensem, Scotum. Subjicitur series vitæ suæ. Bruxellæ, 1596, 8vo. This little work is reprinted in Anderson's Collections, vol. i. Of the account of the author's life, a translation is inserted in vol. iii.

6. A Discourse conteyninge a perfect Accompt given to the moste vertuous and excellent Princesse, Marie Queene of Scots, and her Nobility, by John Lesley, Bishop of Rosse, Ambassador for her Highnes toward the Queene of England, of his whole Charge and Proceedings during the time of his Ambassage, from his entres in England in September 1568, to the 26th of March 1572. This account of the bishop's negociations, which extends to 252 pages, was printed, for the first time, in Anderson's Collections relating to the History of Mary Queen of Scotland, vol. iii. Edinb. & Lond. 1727–8, 4 vols. 4to. As the language was Anglicized by Dr Good, it may be presumed that Lesley intended the work for immediate publication.

7. The History of Scotland, from the death of King James I. in the year M.CCCC.XXXVI. to the year M.D.LXI. By John Lesley, Bishop of Ross. Edinburgh, 1830, 4to. This valuable relique was edited by Thomas Thomson, Esq. from a MS. belonging to the earl of Leven and Melville. Prefixed is a portrait of the author, copied from an old engraving, and representing him as a man of a dignified and sagacious aspect. Of his Scotish history the Latin is not a mere translation. "The readers of this volume," as the editor has remarked, "who may take the trouble of comparing it with the Latin version, will readily perceive that the alterations made by the author on his own original sketch do not consist merely in correction and enlargement; but that, in numerous instances, he has been induced to suppress or generalize those more minute details and domestic occurrences which he may have found less susceptible of that classic attire in which he was naturally ambitious of exhibiting his historical work. In this respect, the present publication may be found to contribute some few particulars to the materials of our national history; but a still higher value will probably be attached to it as a specimen of pure and vigorous composition, in his native language, by one of the most able and accomplished Scotchmen of the sixteenth century." (x.)

LESLIE, CHARLES, was the second son of Dr John Leslie, bishop of Clogher, in Ireland, who was descended from an ancient family in the north of Scotland, and, being an admirable scholar, rose to the dignity of bishop of Orkney in his own country, whence he was, in the year 1633, translated to Raphoe, and afterwards, in 1661, to the see of Clogher, in Ireland.

Our author was born in Ireland, but in what year we have not learned. There is a ludicrous story, indeed, of his having been begotten in prison, and of his father having said that he hoped he would in consequence become the greatest scourge of the covenanters that Great Britain or Ireland had ever seen. This story, with all its circumstances, can scarcely be true; but we think it could not have been fabricated, had not Charles Leslie been born within a year of Cromwell's conquest of Ireland, when the good bishop, having sustained a siege in his castle of Raphoe, was some time kept in close confinement.

We are equally ignorant of the school where he was educated as of the year of his birth; but we know that he received his academical education in Trinity College, Dublin, where he took the degree of master of arts. In the year 1671, he lost his father, when he came over to England, and, entering himself in the temple, studied law for some years, but afterwards relinquished it for the study of divinity. In 1680 he was admitted into holy orders, and, in 1687, was made chancellor of Connor.

About this period he rendered himself particularly obnoxious to the Catholic party in Ireland, by his zealous opposition to them, which was thus called forth. Roger Boyle, bishop of Clogher, dying in 1687, Patrick Tyrrel was made Catholic bishop, and had the revenues of the see assigned him by King James. He set up a convent of friars in Monaghan, and, fixing his habitation there, held a public visitation of his clergy with great solemnity; when, some subtile logicians attending him, he challenged the Protestant clergy to a public disputation. Leslie undertook the task, and performed it to the satisfaction of the Protestants; though it happened, as it generally does at such contests, that both sides claimed the victory. He afterwards held another public disputation with two celebrated Catholic divines, in the church of Tynan, in the diocese of Armagh, before a very numerous assembly of persons of both religions; the issue of which was, that Mr John Stewart, a Catholic gentleman, renounced the church of Rome.

As the Catholics had got possession of an Episcopal see, they engrossed other offices also; and a Catholic high-sheriff was appointed for the county of Monaghan. This proceeding alarmed the gentlemen in that county, who, depending much on Leslie's knowledge as a justice of peace, repaired to him, then confined, by the gout, to his house. He told them, that it would be as illegal in them to permit the sheriff to act as it would be in him to attempt it. But they insisting that he should appear himself on the bench at the next quarter-sessions, and all promising to stand by him, he was carried thither with much difficulty and in great pain. When the sheriff appeared, and was taking his place, he was asked whether he was legally qualified; to which he answered smartly, "That he was of the king's own religion, and it was his majesty's will that he should be sheriff." Leslie replied, "that they were not inquiring into his majesty's religion, but whether he (the pretended sheriff) had qualified himself according to law, for acting as a proper officer; that the law was the king's will, and nothing else to be deemed such; that his subjects had no other way of knowing his will, but as it is revealed to them in his laws; and it must always be thought to continue so, till the contrary is notified to them in the same authentic manner." Upon this the bench unanimously agreed to commit the pretended sheriff, for his intrusion and arrogant contempt of the court. Leslie also committed some officers of the army which the Lord Tyrconnel raised, for offences.

By this spirited conduct Leslie acted like a sound divine and an upright magistrate; but though he thought himself authorized to resist the legal mandates of his sovereign, like many other great and good men, he distinguished between active and passive obedience, and felt not himself at liberty to transfer his allegiance from that sovereign to another. Refusing therefore to take the oaths to King William and Queen Mary, he was deprived of all his preferments; and in 1689 he removed with his family to England, where he published the following amongst other works: 1. Answer to Archbishop King's State of the Protestants in Ireland. 2. Cassandra, concerning the new Associations, &c. 1703, 4to. 3. Rehearsals; at first a weekly paper, published afterwards twice a week in a half-sheet, by way of a dialogue on the affairs of the times; begun in 1704, and continued for six or seven years. 4. The Wolf stripped of his Shepherd's Clothing, in Answer to Moderation a Virtue, 1704, 4to. The pamphlet it answers was written by James Owen. 5. The Bishop of Sarum's [Burnet's] proper Defence, from a Speech said to be spoken by him against occasional Conformity, 1704, 4to. 6. The new Association of those called Moderate Churchmen, &c. occasioned by a pamphlet entitled The Danger of Priestcraft, 1705, 4to. 7. The new Association, part ii. 1705, 4to. 8. The Principles of Dissenters concerning Toleration and occasional Conformity, 1705, 4to. 9. A Warning for the Church of England, 1706, 4to. Some have doubted whether these two pieces were his. 10. The good old Cause, or Lying in Truth, being a second Defence of the Bishop of Sarum from a second Speech, &c. 1710. For this a warrant was issued out against Leslie. 11. A Letter to the Bishop of Sarum, in Answer to his Sermon after the Queen's Death, in Defence of the Revolution, 1715. 12. Salt for the Leech. 13. The Anatomy of a Jacobite. 14. Gallienus Redivivus. 15. Delenda Carthago. 16. A Letter to Mr William Molyneux, on his Case of Ireland's being bound by the English Acts of Parliament. 17. A Letter to Julian Johnson. 18. Several Tracts against Dr Higden and Mr Hoadly. 19. A Discourse, showing who they are that are now qualified to administer Baptism. 20. The History of Sin and Heresy, &c. 1698, 8vo. 21. The Truth of Christianity demonstrated, in a Dialogue between a Christian and a Deist, 1711, 8vo. 22. Of private Judgment and Authority in Matters of Faith. 23. The Case stated between the Church of Rome and the Church of England, 1713. 24. The true notion of the Catholic Church, in Answer to the Bishop of Meaux's Letter to Mr Nelson. Besides these, he published the four following tracts: 25. A Sermon preached at Chester, against Marriages in different Communions, 1702, 8vo. This sermon occasioned Mr Dodwell's Discourse upon the same subject. 26. A Dissertation concerning the Use and Authority of Ecclesiastical History. 27. The Case of the Regal and the Pontificate. 28. A Supplement in Answer to a Book entitled The Regal Supremacy in Ecclesiastical Affairs asserted. These last two pieces were occasioned by the dispute about the right of convocation, between Wake, &c. on one side, and Atterbury and his friends, amongst whom was Leslie, on the other.

It is said by the authors of the *Biographical Dictionary*, that, in consequence of a publication of his, entitled "The Hereditary Right of the Crown of England asserted," he was under the necessity of leaving the kingdom; and that he repaired to the Pretender at Bar-le-duc, where he was allowed to officiate, in a private chapel, according to the rites of the church of England, and where he endeavoured, though in vain, to convert the Pretender to the Protestant religion.

That he repaired to Bar-le-duc, and endeavoured to convert to the faith of the church of England him whom he considered as the rightful sovereign of England, is indeed true; but there is reason to believe that this was not in consequence of his being obliged to leave the kingdom. In the first place, it is more than probable that "The Hereditary Right of the Crown of England asserted" was not written by Leslie; and there is still in existence undoubted evidence, that, in consequence of his great fame as a polemic, he was sent to Bar-le-duc for the express purpose of endeavouring to convert the son of James II., by some gentlemen of fortune in England, who wished to see that prince seated upon the throne of his ancestors. The writer of this article had the honour to be well known to the grand-daughter of one of those gentlemen, a lady of the strictest veracity; and from her he received many anecdotes of Leslie and his associates, which, as he did not then foresee that he should ever have any occasion to use them, he has suffered to slip from his memory. That lady, we have reason to believe, was in possession of many letters by Leslie, written in confidence to her grandfather, both from Bar-le-duc and from St Germains; and by the account which she gave of these letters, Leslie appears to have considered his prince as a weak and incorrigible bigot, though, in every thing but religion, an amiable and accomplished man. This may have been his genuine character, for we know very well that it was the character of his father; but it is not of him that we are now writing.

Mr Leslie having remained abroad from the year 1709 till 1721, returned that year to England, resolving, whatever the consequences might be, to die in his own country. Some of his friends having acquainted Lord Sunderland with his purpose, implored his protection for the good old man, which his lordship readily and generously promised. Mr Leslie had no sooner arrived in London, than a member of the House of Commons officiously waited on Lord Sunderland with the news, but met with such a reception from his lordship as the malice of his errand deserved. Our author then went over to Ireland, where he died, on the 13th of April 1722, at his own house at Glaslough, in the county of Monaghan.

His character may be summed up in a few words. Consummate learning, attended by the deepest humility, the strictest piety without the least tincture of moroseness, a conversation in the highest degree lively and spirited, yet to the last degree innocent, made him the delight of mankind; and has left what Dr Hickes says of him unquestionable, that he made more converts to sound faith and a holy life than any other man of his time.

A charge, however, has been brought against him, which, if well founded, must detract not only from his literary fame, but also from his personal integrity. *The Short and Easy Method with the Deists* is unquestionably his most valuable, and apparently his most original work; yet this work has been published in French amongst the works of the Abbé St Real, who died in 1692; and therefore it has been said, that unless it was published in English prior to that period, Charles Leslie must be considered as a shameless plagiary.

The English work was certainly not published prior to the death of the Abbé St Real, for the first edition bears date the 17th of July 1697; and yet many reasons conspire to convince us that our countryman was no plagiary. There is indeed a striking similarity between the English and the French works; but this is no complete proof that the one was copied from the other. The article PHILOLOGY in this Encyclopædia, of which the late Dr Doig of Stirling was the author, was published the very same week in which Dr Vincent's dissertation on the Greek verb appeared. It was therefore impossible that either of these learned men, who till then were strangers to each other's names, could have stolen aught from the other; and yet Dr Vincent's derivation of the Greek verb bears as striking a resemblance to that of Dr Doig as the Abbé St Real's work does to that of Charles Leslie. In the article MIRACLE, too, the credibility of the gospel miracles is established by an argument, which the author certainly did not borrow from any one, and which the late Principal Campbell of Aberdeen considered as original; yet within half a year of the publication of that article, the credibility of the gospel miracles was treated in the very same manner by Dr Sayers, though there is in his dissertation complete internal evidence that he had not seen the article in this Encyclopædia. Further, the author of this sketch reviewed, in one of the Journals, the work of a friend, which was at the same time reviewed in another Journal which he never saw. Yet he was told by a friend, who was conversant in that kind of reading, and knew nothing of his concern with either Journal, that the book in question must, in both, have been reviewed by the same hand, because in both the same character was given of it in almost the very same words.

After these instances of apparent plagiarism, and which we know to be only apparent, has any man a right to say that Charles Leslie and the Abbé St Real might not have treated their subject in the way that they have done, without either borrowing from the other? The coincidence of arrangement and reasoning in two different works is indeed very surprising; but it is by no means so surprising as the coincidence of etymological deductions which appear in the writings of Drs Doig and Vincent. The divines reason from the acknowledged laws of human thought; the reasonings of the grammarians, with all deference to their superior learning, we cannot help considering as sometimes a little fanciful.

But this is not all that we have to urge on the subject. If there be plagiarism in the case, and the identity of titles looks very like it, it is infinitely more probable that the editor of St Real's works stole from Leslie, than that Leslie stole from St Real; unless it can be proved that the works of the abbé, and this work in particular, were published before the year 1697. At that period the English language was very little read or understood upon the Continent, whilst in Britain the French language was, by scholars, as generally understood as at present. Hence it is, that so many Frenchmen, and indeed foreigners of different nations, thought themselves safe in pilfering from the British philosophers; whilst there is not, in as far as we know, one well authenticated instance of a British philosopher appropriating to himself the discoveries of a foreigner. Is it then very improbable that the editor of the works of St Real would claim to his friend a celebrated tract, of which he knew the real author to be obnoxious to the government of his own country, and therefore not likely to have powerful friends to maintain his right?

But further, Dr Burnet, bishop of Sarum, was an excellent scholar, and well read, as every one knows, in the works of foreign divines. Is it conceivable, that this prelate, when smarting under the scourge of Leslie, would have let slip so favourable an opportunity of covering with disgrace his most formidable antagonist, had he known that antagonist to be guilty of plagiarism from the writings of the Abbé St Real? Let it be granted, however, that Burnet was a stranger to these writings and to this plagiarism; it can hardly be supposed that Le Clerc was likewise ignorant of them. Yet this author—when, for reasons best known to himself, he chose, in the year 1706, to depreciate the argument of Leslie's *Short and Easy Method*, and to traduce its author as ignorant of ancient history, and as having brought forward his four marks for no other purpose than to put the deceitful traditions of popery upon the same footing with the most authentic doctrines of the gospel—does not so much as insinuate that he had borrowed these marks from a popish abbé, though such a charge, could he have established it, would have served his purpose more than all his rude railings and invective. But there was no room for such a charge. In the second volume of the works of St Real, published in 1757, there is indeed a tract entitled *Méthode Courte et Aisée pour combattre les Deistes;* and there can be little doubt but that the publisher wished it to be considered as the work of his countryman. Unfortunately, however, for his design, a catalogue of the abbé's works is given in the first volume; and in that catalogue the *Méthode Courte et Aisée* is not mentioned.

We have dwelt thus long on *The Short and Easy Method with the Deists*, because it is one of the ablest works that ever was written in proof of the divine origin of the Jewish and Christian Scriptures; a work of which the high merit was acknowledged even by Lord Bolingbroke, and which, as is well known to theological scholars, Dr Conyers Middleton confessed to be unanswerable. If by men of science we should be thought to have spent our time well in vindicating the rights of some of our illustrious philosophers, to discoveries which have been unjustly claimed for the philosophers of Germany and France, we will not surely, by the friends of Christianity, be thought to have employed our time ill in vindicating Leslie's claim to this decisive argument in support of our holy religion.

Leslie, *Sir John*, Professor of Natural Philosophy in the University of Edinburgh, and author of several scientific works, inventions, and discoveries, of great celebrity, was born at the village of Largo, in the county of Fife, on the 16th of April 1766. If, in sketching the Life of this eminent person, we should happen to exceed the usual limits of our biographical notices, we can at least plead in excuse that we have done so in the case of one of the greatest benefactors of this Encyclopædia—one whose counsels led to not a few of the improvements which distinguish the later years of its history, and to whom it is indebted for many contributions, marked with the stamp of his vigorous and original powers. It is painful to us to recollect the number of similar claims to our attention. Too many illustrious contemporary benefactors have, like him, left us the mournful duty of preserving some memorials of their personal history, in the work which received from their co-operation its highest honours and proudest recommendations.

He was the son of humble, but, in their line of life, highly respectable parents, who lived to enjoy the celebrity of their son, and for whom he ever cherished that affection which formed a marked feature of his character, in regard to all the members of his family. His father, originally from the neighbourhood of St Andrews, lived for some time at Anstruther, but ultimately settled at Largo, as a joiner and cabinet-maker. His wife, Anne Carstairs, was a native of that place; and the subject of this article was the youngest child of their marriage. Though he attained in manhood a robust frame, he was, in early youth, of a very feeble constitution; so much so, that when sent, at four years of age, to a sort of school, kept by an old woman, who plied her wheel whilst teaching the alphabet, he was indulged with a separate stool, near the fire-place, which the dame set apart for the feeblest of her juvenile pupils. As long as he was permitted to monopolize this seat of honour, he seems to have been tolerably pleased with his situation; but being at length superseded by a younger, or more favoured pupil, he eloped from the school, hid himself for a day in some obscure corner, and, when obliged to come forth, obstinately refused to return to the tutelage of the ancient spinster. He was in consequence placed in another school, where he remained six months, and was taught writing and arithmetic; his father and his eldest brother, who appear to have possessed some knowledge of the elementary parts of mathematics, giving him, at the same time, his first lessons in that science. He was afterwards entered at a school in the neighbouring town of Leven, where Latin was taught; but his intense dislike, at this time, to that language, and his inability to walk and return daily a distance of three miles, induced his parents to discontinue his attendance, after a short trial of six weeks. Such was the brief and meagre *curriculum* which formed the whole training of the future mathematician and philosopher, previous to his being entered a student at the University of St Andrews! But we must not too hastily despatch this early period of his life, when his genius, working with its own inward resources, already began to attract observation.

The first person of any sort of distinction who noticed his precocious attainments, was Mr Oliphant, who became Minister of Largo about the time when the boy had reached his eleventh or twelfth year. Struck with the knowledge in mathematical and physical science which he displayed, the reverend gentleman kindly lent him some scientific books, with which he was but poorly provided; and he also strongly urged him to study Latin,—telling him, by way of showing the necessity of an immediate commencement, that it had cost himself seven years to acquire that language. This was the worst argument that could be urged to the young philosopher, who unhesitatingly declared that he never would bestow half that time upon any language, and that he particularly disliked Latin. In this state of his knowledge and taste, he was, in his thirteenth year, sent to the University of St Andrews to study mathematics under Professor Vilant. On examination by the Professor, he was found already qualified for the second or senior class; and, at the close of the session, he obtained a prize. It is remembered, as a characteristic particular, that having previously discovered, in some of those antiquarian researches to which also he was early addicted, that it was not indispensable for students of the first year to wear a gown, he steadily refused, during this year, to exhibit himself in the accustomed academical habiliment.

This session proved a decisive one as to the course of his future studies. The Earl of Kinnoull, then Chancellor of the University, having been informed of his remarkable abilities, sent for his father, and proposed to him to defray the expense of his son's education, provided the father would agree to maintain him at college, with the view of qualifying him for the Church. The proposal was readily embraced; and the repugnance of the youth to apply himself to Latin was at length overcome, by making the permission to attend the Natural Philosophy class of next session,—the great object of his desire,—conditional on his agreeing to qualify himself, during the vacation, for attending also the Latin class. With this lure before him, he applied assiduously to his lessons, under the direction of a private teacher, and succeeded in fitting himself for admission into that class. No one could discover, in his after life, any traces of this early and vehement dislike to Latin; for though he ever held that the learned languages were suffered to engross too much attention in our system of education, and was by no means sparing of reprehension upon this subject,[1] his own scholarship had become considerable; and indeed his writings manifest a more than ordinary degree of fondness for embellishing the conclusions of science with illustrations from the Greek and Latin Classics. He continued to the last to read them occasionally, particularly Lucretius, whose bold and imaginative philosophy, and splendid descriptions, were peculiarly adapted to his taste. He came also to be well versed in the theory of grammar; and his observations upon languages often evinced learning, as well as ingenuity.

His health, at the period above alluded to, was still so delicate that it became necessary to moderate and regulate his studious habits; but he succeeded, during his second session, in acquiring additional honours, and in attracting in a more marked degree the flattering attentions of the Chancellor, who kindly invited him to Dupplin Castle, where, notwithstanding the bashfulness of his manner, he contrived to impress the other visitors with a high opinion of his powers. About the same time, he became known to Mr Playfair, on occasion of a visit which the latter, alongst with the Reverend Dr Small, made to St Andrews. Dr Small's son was a fellow-student and companion of young Leslie, and hence his introduction to both these mathematicians. Mr Playfair was at this time parish minister of Liff, in Forfarshire. Here he was afterwards visited by his young acquaintance, neither of them then dreaming of that lot which was to place them, in succession, in two conspicuous Chairs of the University of Edinburgh, destined to derive from both additional lustre and recommendations. His visits to Mr Playfair were continued after the latter, in 1782, resigned his clerical charge, in order to superintend the education of the present Robert Ferguson, Esq. of Raith, and his brother Sir Ronald. It was in this way, we believe, that he first became known to these excellent and distinguished men, then youths of his own age; and the acquaintance, in after years, ripened into a warm and lasting friendship, alike honourable to both parties, and which formed one of the chief and most valued solaces of his life.

In 1783 or 1784, he quitted St Andrews, and proceeded to Edinburgh, with the intention of entering himself a student of Divinity in the metropolitan university. He was accompanied by a fellow-student, destined, like himself, to obtain a distinguished niche in the Temple of Science, James Ivory; and they lived together for some time. He never had any liking for the Church as a profession; and though he was formally entered at the Divinity Hall, he contrived to devote his first session to the sciences, particularly to Chemistry. In fact, he seems early to have relinquished all thoughts of the Church;—a resolution perhaps hastened by the death of his patron the Earl of Kinnoull, which took place soon after his removal to Edinburgh. He continued to study here till the close of the session of 1787; and, as is customary with students of greater ability and industry than means, devoted part of his time to private tuition. One of the young men whose studies he assisted was nearly related to, and became the heir of, Dr Adam Smith; a circumstance which he was accustomed to recollect with pleasure, as having made him known to that illustrious philosopher, who treated him kindly, and occasionally favoured him with directions as to his own pursuits. His first essay as an author must have been composed about the time of his leaving this university. It was a Paper *On the Resolution of indeterminate Problems*, which was read to the Royal Society of Edinburgh by Mr Playfair, in 1788, and published in their *Transactions*.[2]

In this year, he was prevailed upon by two young students of the name of Randolph, and of the distinguished American family of that name, to accompany them, in capacity of tutor, to Virginia; and he accordingly left Scotland alongst with them. They arrived at the place of their destination in the beginning of November; and his time afterwards seems to have passed both agreeably and usefully. He was all his life fond of visiting other countries, and perhaps a little disposed to underrate his own. Thus he was wont to say, that the thunder-storms of Virginia took away all feelings of awe at those of Scotland, just as the Alps of Switzerland left him nothing to admire in the Scottish mountains. His stay in the new world did not much exceed a year, owing to the breaking up of the family establishment by the death of the father of his young friends. After visiting New York and Philadelphia, he returned to his native place towards the close of the year 1789.

From some letters to his family, written about the time of his leaving America, his thoughts seem to have been anxiously directed to his future means of employment and support; and one of his schemes appears to have been to try his fortune in India, probably as a civil engineer. This notion recurred afterwards, but without leading to any results. His next field of adventure was London, whither he proceeded in January 1790, carrying with him various letters of recommendation; one of which was written by Dr

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[1] "The great error," says he, "in modern education consists in the undue attention paid to the dead languages, which consumes the precious time that should be devoted, during the freshness of youth, to the higher intellectual pursuits." (See Preface to his *Rudiments of Geometry*, published in 1828.)

[2] See vol. ii. p. 193.

Adam Smith, then drawing near the close of his career. It was on this occasion, if our recollection does not mislead us, that Dr Smith exhorted his young friend never to approach any author whose favour he might wish to win, without first reading his book, lest the conversation should happen to turn that way. One of Mr Leslie's objects in visiting the capital, was to ascertain what success he might expect from a course of Lectures on Natural Philosophy; and the information he received soon satisfied him, as he says in a letter to one of his brothers, that "rational lectures would not succeed." He therefore employed himself for some time in writing for the *Monthly Review*, and in executing literary jobs delegated to him by his countryman Dr William Thomson, author of the continuation of Watson's *History of Philip the Third*, and of many other works now forgotten, and who was much in the habit of lending his versatile pen, as well as his name, to those who required the assistance or recommendation of either. But a more eligible and suitable connection was ere long opened to him, by the invitation of the younger Wedgewoods, who had been his fellow-students at Edinburgh, to reside with them, and superintend their studies. He readily acceded to their proposals; and proceeded, in April 1790, to their residence at Etruria, in Staffordshire, where he remained till the close of 1792, in the enjoyment of a liberal salary, and of society at once agreeable and intelligent. This was, in every sense, a happy and profitable period of his life. The time not devoted to tuition was assiduously employed in experimental investigations, and in completing a translation of Buffon's *Natural History of Birds*, which he had previously undertaken for a London bookseller. It was published in 1793, after he left Etruria, in nine volumes octavo. Though executed with fidelity and vigour, it was valued by himself, at least after he became otherwise eminent, only as having, by the sum which it procured him, laid the foundation of that pecuniary competency which he early foresaw to be necessary to the independent prosecution of his favourite studies; and which his industrious and prudent habits enabled him in no long time, in a moderate degree, to attain. The preface, however, speaks of this "first attempt" with some anxiety; and endeavours to bespeak favour for it as executed "at an early period of life, and in the retirement of the country." This preface is written in that nervous, but strained and ornate style, which characterises his after writings. His first contribution to Natural Philosophy, entitled *Observations on Electrical Theories*, was also written at Etruria; and was, in 1791, transmitted to the Royal Society of Edinburgh, for insertion in their *Transactions*. This was promised; but performance having, as he thought, been long and unhandsomely deferred, he indignantly recalled his Paper, and laid it aside for many years. It did not, indeed, see the light till 1824, when he was induced to publish it in the *Edinburgh Philosophical Journal*,[1] conducted by his distinguished friend Professor Jameson.

About the period of the close of his agreeable engagement at Etruria, which was occasioned, we believe, by the ill health of Mr Thomas Wedgewood, and the marriage of his younger brother, a Cornish gentleman with whom he had become acquainted at that place proposed to engage him as a companion in an extensive tour through Greece, Egypt, and the Holy Land. Ever fond, as he was, of visiting foreign countries, particularly those hallowed by memorable events or classical associations, the proposal could not but prove agreeable to him, and it was accordingly embraced with alacrity. The tour was to commence early in 1793; but a change of plan having been decided upon without his concurrence, and by which he found that his observations were to be transferred to another, he indignantly relinquished the engagement. His intention to visit these interesting countries, when a fit opportunity should occur, remained with him through life; and, at a period nearly forty years subsequent to this,—in his last years, indeed,—he actually made some preparations for a year's sojourn in Egypt and Palestine, from which he was diverted only by engagements and avocations of which he found it difficult to disencumber himself.

After leaving Etruria, he passed some months in Holland; a country which, like Descartes, he seems to have thought peculiarly suited to secluded study, and where he at this time acquired the German language. Thereafter, he returned to Largo, where he remained for about two years, devoted to experimental researches, in the course of which he invented and perfected his Differential Thermometer; the parent, if we may so speak, of that beautiful family of philosophical Instruments,[2] with which he enriched the Treasury of Science, and amplified and variegated the means of physical inquiry. His ingenuity had been early exercised in some attempts to construct an accurate Hygrometer, and these ultimately suggested to him the well-known contrivance above named;—a contrivance happily adapted to the measurement of the smallest variations of temperature, and which richly rewarded his inventive powers by its ministry to the achievement of his subsequent discoveries. It has generally, indeed, been allowed to be one of the most useful as well as elegant inventions that inductive genius ever applied to the investigation of chemical changes. At a later period, when his name had attained a high degree of celebrity, he, like most of the other sons of genius, was made to feel that fame brings with it pains as well as pleasures; for it was now discovered that the Differential Thermometer, instead of being an invention of his own, perfected, as he has himself recorded, in the course of a series of experiments on the evaporation of ice, which the severe winter of 1794–5 afforded him an opportunity of performing,[3] was in reality a plagiarism, if not from Van Helmont, who died in 1644, at any rate, from John Christopher Sturmius, who died some sixty years later. Such was one attempt to impeach the originality of this eminently inventive experimentalist. An Instrument of which all the world remained ignorant, till he, by means of it, told the world the better part of all it yet knows concerning the phenomena of radiated heat, was discovered to have been furtively purloined from one or other of these worthies! Neither the authors nor the abettors of this allegation pretended that either Van Helmont or Sturmius ever dreamt of such applications, or derived such results from their supposed invention, as were reserved, by some caprice of chance, no doubt! for its luckier plagiarist; and it is now, we believe, allowed, that this is just one of those cases of curious but partial anticipation so frequently to be met with in the history of science, and where the ultimate discoverer shows, by his skilful and fruitful employment of the disputed invention, how much he surpassed, and how little he needed the help of, those whom he is ungenerously supposed to have robbed of their legitimate honours.

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[1] See vol. xi. p. 1.

[2] These Instruments, viz. the Differential Thermometer, Hygrometer, Hygroscope, Photometer, Pyroscope, Æthrioscope, and Atmometer, are all described, and their principles explained, by himself, in the articles CLIMATE and METEOROLOGY. The latter, like the former, will, at the proper place, be transferred, to this work, from the *Supplement* to the preceding editions. Properly speaking, the Hygrometer was the parent instrument; the Differential Thermometer having been invented in the course of his endeavours to improve it; but as the Hygrometer, in its latest form, is only a modification of the other, it may be represented as derived from it. See the article COLD.

[3] See the article METEOROLOGY.

In the spring of 1796, Mr Leslie received an invitation from his friend Mr Thomas Wedgewood, to accompany him in a tour through the north of Germany and Switzerland. To this proposal, which was every way agreeable, he immediately acceded. They arrived at Hamburg about the first of May, and employed that and the next four months in their tour, part of which was performed on foot. He alludes to their observations in the course of their journeyings amongst the mountains of Switzerland, in one of the notes to his work on Heat; but of this, as of all his subsequent tours on the Continent, he kept regular Journals, which are still preserved, and which show that he was no less observant of the social, moral, and economical condition of the countries he visited, than of their geological, meteorological, and physical aspects.

For some years after the period just mentioned, he seems to have employed himself in his experimental pursuits, and to have divided his time, chiefly, between London and Largo; to which place, and to the society of his family, he ever was fondly attached. His earnings by literary labour, and his allowances, had raised his humble fortune to what a philosopher might view as an independence; and he accordingly employed or amused himself as his own inclinations dictated. Early in the summer of 1799 he set out with an old college acquaintance on a tour to the northern kingdoms of Europe; in the capitals of which, the latter, who had for some time been settled in Spain as a merchant, had business to transact. After traversing Denmark, part of Norway, and Sweden, they proceeded through Brandenburg to Berlin; and from thence returned to England about the end of November. From his Journal of this tour, which is more detailed than any of those he subsequently kept, the Swedish mines appear to have formed particular objects of his attention. One of his entries records his having, before quitting Hamburg, written an account of his Hygrometer, for insertion in Voght's *Magazine*, and in the *Annales de Chimie*.

In the following year, he published the Paper just mentioned, but with some alterations, in Nicholson's *Philosophical Journal*. It is entitled a *Description of an Hygrometer and Photometer;* and was followed with *Additional Remarks* on these Instruments. In the same year, he also published, in that Journal, a Paper *On the Absorbent Powers of the Different Earths;* and other two, containing *Observations and Experiments on Light and Heat, with Remarks on the Inquiries of Dr Herschel on these objects.*[1] These small pieces are very valuable, as showing the progress of his researches and discoveries in that field of inquiry which their titles indicate.

The results of his more extended investigations were ere long to appear before the world in a different shape. Having collected at Largo all the necessary apparatus, he prosecuted with ardour a series of experiments, which enabled him, in the years 1801 and 1802, to compose the bulk of his celebrated work on Heat. In the latter year, "the gleam of peace," as he tells us in his usual ornate style, "tempted him to indulge in a temporary suspension; and to repair to the famed capital where the treasures of art and science are so profusely displayed. In that vortex of pleasure and centre of information, I spent," he adds, "several months very agreeably; but the work I had undertaken recalled my thoughts, and I hastened again to my retreat."[2] His *Experimental Inquiry into the Nature and Properties of Heat* was here at length completed. It was published at London in the spring of 1804, with a dedication, couched in terms of strong and affectionate friendship, to Mr Thomas Wedgewood, the companion of his studies at Etruria, and of his first continental tour. The early death of that ingenious and excellent person, whose delicate health is here feelingly alluded to, was always mentioned by him as a public as well as private misfortune. The originality and boldness of the peculiar doctrines of the *Inquiry*, and the number of new and important facts disclosed by its ingenious experimental combinations, conspired to render it an object of extraordinary interest in the scientific world; and, indeed, it must ever be viewed as constituting an era in the history of that branch of physical science which forms its subject. The Royal Society of London unanimously adjudged to its author the Rumford Medals appropriated as the reward of discoveries in that recondite province. As a philosophical disquisition, it is far, however, from being perfect. Its hypotheses are not warranted by the sober maxims of inductive logic; and its method and style are alike liable to serious criticism. But it would be difficult to name any work in the whole range of physical science more strongly indicative of a vigorous and inventive genius; and it must be allowed by all, that its beautifully devised experiments, and its large stock of new observations, far more than atone for its questionable theories, and for that desultory arrangement, and those ambitious modes of expression, which so often mar its reasonings and obscure its sense. More than ten years before the appearance of this work, Mr Leslie wrote an essay on *Heat and Climate*, which contains some of the theoretical opinions advanced in the former, as well as the germs of some of its discoveries. It was read at two successive meetings of the Royal Society of London in the spring of 1793; but it was not admitted into the *Transactions* of that body. Its aspiring author was not of a disposition to be checked in the career of inquiry by this repulse; and he did not shrink from bringing his Paper forth, in 1819, from its long oblivion of twenty-six years; he having then published it, for the first time, in Dr Thomson's *Annals of Philosophy*.[3]

Twice before that period of his life at which we are now arrived, Mr Leslie had appeared as a candidate for an Academical Chair; first in the University of St Andrews, afterwards in that of Glasgow, and on both occasions without success. He was again to try his fortune in the same line in the Metropolitan University. Early in the year 1805, a vacancy occurred in its Mathematical Chair, owing to the removal of Professor Playfair, on the death of Dr John Robison, to that of Natural Philosophy. This afforded a new opening to his academical ambition; and he was particularly desirous to occupy a Chair upon which the names of the Gregories, of Maclaurin, of Matthew Stewart, and of Playfair, had shed so much lustre. He accordingly presented himself as a candidate; and, with his now high reputation as a discoverer and original thinker, and his known eminence in mathematical science, it was not to be expected that he could have any formidable competition to surmount. Nor did there occur any, in as far as fame or talents were concerned. His principal competitor, though a man of amiable character, and respectable attainments, was wholly unknown in the scientific world, and as inferior to him in abilities as in renown. But he was one of the Ministers of the City, and supported with all the influence of that body; then pretty generally suspected of a wish to secure a monopoly of the

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[1] See Nicholson's *Journal* for 1800, vol. iii. p. 461–518, and vol. iv. p. 196, 344, 416.

[2] Preface to the *Experimental Inquiry on Heat.*

[3] See vol. xiv. p. 5–27, and vol. xvi. p. 7, for some just observations by the very able Editor.

Philosophical Chairs of the University. It soon, however, became known that the Patrons were determined to decide upon a comparison of claims, and that Mr Leslie must triumph. In this state of things, and in an evil hour for themselves, the City Clergy were induced to raise an objection to his eligibility, on the serious ground of his having, in one of the notes appended to his work on Heat, approved of a doctrine directly leading to atheism. We are sorry to be obliged to notice this discreditable proceeding; but it forms too memorable an occurrence in Mr Leslie's life to allow us to pass it without some animadversion. In the note alluded to, the author, though no metaphysician, and in general rather a contemner of metaphysical science, was, naturally enough, led to illustrate what he had said in the text with reference to the unphilosophical opinion that impulse is necessary to the production of motion, by some remarks on *Causation*. He prefaces these by observing, that Mr Hume was the first who treated this subject "in a truly philosophical manner;" and that "the unsophisticated notions of mankind are in perfect unison with the deductions of logic, and imply nothing more at bottom, in the relation of cause and effect, than a constant and invariable sequence."[1] Founding upon these remarks, the Ministers of Edinburgh charged him with having "laid a foundation for rejecting all the argument that is derived from the works of God to prove either his Being or Attributes."[2] This heavy charge was preferred in a formal Protest, tendered by them to the Patrons of the University, in which they alleged that, in the election of Professors, the former were, by the charter of erection, bound to act *with the advice of the Ministers.* That advice was, in the present instance, given with sufficient emphasis; but the Patrons, much to their honour, treated it as it deserved; and Mr Leslie, to the great joy of all liberal minds, was, in March 1805, elected to the Mathematical Chair. The efforts of the disappointed junto did not, however, cease with this rebuff; nor did they desist from their ill-starred opposition, till a decision of the General Assembly of the National Church, pronounced on the 23d of May, after a memorable debate of two days,[3] satisfied them that persecution had now exhausted its resources, and that its hopes must, however sorrowfully, be relinquished. Dismissing any supposition of interested designs, and even allowing that Mr Leslie's expressed opinion as to *Causation*, if taken apart from the subject-matter of his book, or left unexplained, was calculated to occasion some alarm in the minds of the pious, still, impartial history ever must brand the proceedings of his opponents as alike uncharitable, unfair, and arrogant; and as deeply injurious to the character of that Church with whose name and authority they clothed themselves. It was on all hands admitted, that if Mr Leslie had, by a single word, limited his observations to *Physical* causes, they would have been wholly free from objection; and, surely, it required a most perverse and intolerant construction to extend to any but such causes, the observations of an illustrative note to a work purely physical, and undeniably levelled at those theories which resort to certain invisible *intermedia*, in order to account for the connection of physical sequences. But this was not all. Mr Leslie, on being informed of the charge, immediately declared, in a very pointed Letter laid before the junto, that his observations "*referred entirely* to the relation between cause and effect, considered as an object of *physical* examination."[4] Yet was this prompt explanation disingenuously disregarded—nay suppressed; whilst his persecutors—owing to an ignorant blunder in their statement of what they conceived to be the true notion of *Causation*—were themselves obliged to have recourse to explanation, in order to show that their doctrine was not identical with that of the Fatalists and Spinoza![5]

Mr Leslie commenced and prosecuted his official duties with great ardour. He entertained lofty ideas of the dignity and utility of the professorial character, and was thus disposed to make all the exertions necessary to success. Though the bent of his genius lay more to Physics than to Pure Mathematics, he had cultivated the study of Geometry with kindred relish; and with an admiration, in particular, of the analytical investigations of the ancient geometers, which led to his happiest essay in that science. As a teacher, he not only laboured to promote the study, but to procure for it a larger share of attention than our academical system usually assigns to it. His instructions were better suited, perhaps, to youths of superior ability than to ordinary students; but reputation and intellectual power produced their usual results, and secured for him an attendance as numerous as could be expected by any teacher, during the whole of the fifteen years that he occupied the Mathematical Chair. Soon after his election, he resolved to compose and to publish, at successive intervals, a complete "Course of Mathematics," digested and arranged according to his own ideas of what was wanted towards promoting a purer taste in the cultivation of the science. Of this Course, the first volume, comprising *Elements of Geometry, Geometrical Analysis, and Plane Trigonometry,* was published in 1809; and it has gone through several very extensive editions. The first part of it has been viewed as the least perfect and useful; but his own favourite portion, on *Geometrical Analysis*, has been extolled by the most unsparing critics of the former, as "a great acquisition to Elementary Geometry; and as calculated to keep alive the knowledge of a most beautiful and interesting branch of the mathematics, which has been too much overlooked during the improvement of the more general and powerful methods of algebraic investigation."[6] Abroad, it seems to have been viewed in a light equally favourable; as it was speedily translated into the French and German languages. He re-produced it, with considerable emendations, in the second volume of his "Mathematical Course," which, besides, contains the *Geometry of Curve Lines.* This volume was not published till 1821—an interval of twelve years having thus elapsed from the appearance of the first. A third volume, on *Descriptive Geometry, and the Theory of Solids,* was still wanting to complete his original design; but his removal to another Chair, and other circumstances, called his attention to different objects, and his "Mathematical Course" was thus left unfinished.

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[1] *Inquiry into the Nature of Heat*, p. 135, and Note 16, p. 522.

[2] Professor Stewart's *Short Statement of Facts relative to the Election of a Mathematical Professor in the University of Edinburgh*, p. 44.

[3] See *Report of the Debate*, published at Edinburgh, in October 1805.

[4] See Professor Stewart's *Short Statement*, p. 36, and *Report of the Debate in the General Assembly*, p. 16.

[5] See *Short Statement*, p. 77-94, and *Report of the Debate, passim.* This remarkable controversy gave rise to a number of other publications; but none of them, with the exception of these two, an admirable *Letter* to the author of a Reply to the former, by Professor Playfair, and Dr Brown's *Observations on the nature and tendency of the doctrine of Mr Hume concerning cause and effect*, with other two pieces by that most acute metaphysician, have the least chance of interesting posterity The two pieces alluded to were, *A short criticism of the terms of the charge against Mr Leslie in the Statement of the Ministers of Edinburgh*, and *An examination of some remarks in Dr Inglis's Reply to Professor Playfair.* The Reply by Dr Inglis was the ablest production on the clerical side, and certainly evinced a good deal of controversial ability.

[6] *Edinburgh Review*, vol. xx. p. 98.

He was induced, at a late period of his life, to recast the first volume in a greatly abridged form. His object in doing so was to accommodate it to the use of those who, in riper years, become desirous to supply the defects of early education, and to qualify themselves for obtaining some knowledge of Natural Philosophy. This abridgment appeared in 1828, under the title of *Rudiments of Plane Geometry, including Geometrical Analysis, and Plane Trigonometry.* In connection with his mathematical works, though forming no part of his " Course," we may here mention the profound and learned treatise on the *Philosophy of Arithmetic*, which he published in 1817. It was a republication, with considerable alterations and additions, of one of the numerous articles contributed by him to the *Supplement* to the former editions of this Encyclopædia.

It was not to be expected that the labours of the Mathematical Chair would wean Professor Leslie from his experimental inquiries. His fine Instruments were always at hand, and always in use, in connection with some ingenious conception or other. Early in the summer of 1810, he determined to proceed with some experiments previously suggested in the course of his researches with his Hygrometer, but which had for some time been suspended; and they now conducted him to the discovery of that beautiful process of Artificial Congelation, by which he was enabled to produce ice, and even to freeze mercury, at pleasure. The discovery was achieved by means of a happily-conceived combination of the powers of rarefaction and absorption, effected by placing a very strong absorbent under the receiver of an air-pump. It was in the month of June of that season that the discovery was consummated.[1] We happened to witness this consummation,—at least the performance of the first successful repetition of his process,—and we never shall forget the joy and elation which beamed on the face of the discoverer, as, with his characteristic good nature, he patiently explained its principles, and the steps by which he had been led to it. We could not but feel, on looking at, and listening to him, how noble and elevating must be the satisfaction derived from thus acquiring a mastery over the powers of Nature, and enabling man, weak and finite as he is, to reproduce her wondrous works! Proportioned to the admiration which such achievements are calculated to excite, ought to be the disapprobation of any unfair endeavours to lower or depreciate them. We have already alluded to an attempt to divest this illustrious experimentalist of the honours connected with his Differential Thermometer; and we have now to add, that several years after the discovery of his process of Artificial Congelation, there were some similar endeavours to transfer the merit of it to a gentleman of the name of Nairne. The claim for him was founded on a Paper published in 1777, in the *Transactions* of the Royal Society of London; from which it appeared that he was acquainted with the facts, that evaporation produces cold, and that sulphuric acid, the absorbent employed by Mr Leslie, imbibes moisture. But in order to decorate Mr Nairne with the laurels of the latter, his depreciators ought to have been able to show, that the former had combined the properties alluded to, in a manageable process for the production of ice *ad libitum.* In such an attempt they must have failed ignominiously; and, perhaps, there is not in the whole history of science any more triumphant reply to a charge of plagiarism, than is furnished by the admitted facts, that with Mr Nairne's Paper before them for a long course of years, the scientific world remained utterly ignorant of the existence of any such process till the date of Mr Leslie's discovery; nay, that with his description of that process in their hands, the most distinguished experimentalists of the capital failed in their trials of it, till it was performed there by himself, in the ensuing summer![2]

In a letter from London to one of his friends, written in June 1811, he says, " My package has at last arrived, and I shall proceed without delay to make my *debut.*" It was only now that the experiment was first successfully performed in the capital. This took place before a meeting of some members of the Royal Society, and others. The discovery was announced in the same year, in the Memoirs of the French Institute; and the process itself was afterwards exhibited, in presence of that body, by M. Pictet and M. Gay-Lussac.[3] He did not himself publish any detailed account of his experiments and views on this interesting subject till 1813, when he explained them at considerable length, in a small volume entitled *A short Account of Experiments and Instruments depending on the Relations of Air to Heat and Moisture.* This publication, which was partly intended to promote the circulation of his Instruments, and to explain their principles, would have been infinitely more useful had its author superadded the powers of methodical and elementary exposition to his other endowments. But notwithstanding its defects in these particulars, it was much commended by those competent to appreciate its value as a contribution to science.[4] Closely connected with the subjects of this treatise, and which, therefore, we may notice here, though it did not appear till some years later, was an ingenious Paper, published in 1818, in the *Transac-*

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[1] See the article Cold. The successive steps of the discovery are here recorded by himself, in those *verba ardentia* which the bent of his genius so strongly prompted him to employ.

[2] Some very complete and curious legal evidence of these facts was adduced by Professor Leslie, in 1822, in a prosecution which he was advised to institute against the publisher of a well-known *Magazine*, for a series of libels inserted in that work, and in one of which he was accused of having stolen the discovery alluded to, from Mr Nairne. Amongst other witnesses, two very distinguished Chemists were examined on that occasion—the late Dr Marcet, and Dr Thomson, Professor of Chemistry in the University of Glasgow. We shall extract a small portion of that of Dr Marcet, to whom Mr Leslie was, personally, but little known.—" *Q.* Is it your opinion that Mr Leslie is to be considered as having borrowed or stolen this discovery, or do you consider his discovery to be original?—*A.* Some of the facts were known long before, but the process itself is perfectly original.—*Q.* Is the discovery of Mr Leslie analogous to other discoveries in the science of chemistry?—*A.* There is hardly any discovery of the least value that has been made in that science but from the known properties of bodies. It is by combining those properties, so as to produce certain effects, that a discovery is made.—*Q.* Then, you mean to say that Mr Leslie has done what none before him ever accomplished?—*A.* Certainly. He has done what the whole philosophic world, with all the facts before them for a long period, had not been able to accomplish.—*Q.* When and by whom was the experiment first successfully performed in London?—*A.* It was successfully performed in London by Mr Leslie himself. My belief is, that no one succeeded in this experiment, in London, until Mr Leslie himself showed the way.—*Q.* Do you know that Sir Humphry Davy tried and failed?—*A.* I cannot positively say; I believe he tried it, but without success." (*Report of the Trial by Jury, Professor Leslie against William Blackwood*, p. 82-6.)

[3] See *Mémoires de la Classe des Sciences Mathématiques et Physiques*, t. xii. p. 80; t. xiv. p. 117-18.

[4] See *Edinburgh Review*, vol. xxiv. p. 339-52, and Dr Thomson's *Annals of Philosophy*, vol. ii. p. 457-62, for a skilful analysis of this treatise. In the Trial above alluded to, the party prosecuted took an *Issue* to show that the article in the *Edinburgh Review* in commendation of the work, was written by Mr Leslie himself. The attempt was not made; and it is hardly worth while to mention, with reference to such a charge, that the article was written by a very able chemist, the late Dr John Murray.

tions of the Royal Society of Edinburgh, under this title: *On certain impressions of cold transmitted from the higher atmosphere; with a description of an Instrument adapted to measure them.* The Æthrioscope, the instrument here alluded to, is, in another place, described, in the poetical language of its author, as "fitted to extend its sensation through indefinite space, and to reveal the condition of the remotest atmosphere."

In the autumn of 1814, Professor Leslie indulged himself with a tour of six weeks in France and the Netherlands. He never was satisfied if he allowed a vacation to pass without seeing or revisiting some foreign scenes. One or two extracts from Letters written by him on the present occasion, may be here introduced, as either curious in themselves, or characteristic of the writer. Writing from Paris, on the 1st of August, he says, "you know that it was not my intention at present to mix much with the *Sçavans.* But I have been so well received, and even feasted by them, that I may perhaps depart a little from my original design. Humboldt has been very kind and attentive to me, and introduces me wherever I want. They are much better acquainted with what we are doing than I should have imagined. My book on Heat is better known than in England. I was even reminded of some passages in it which in England were considered as fanciful, but which the recent discoveries on the Polarity of Light have confirmed. Even Laplace has, in consequence of some observations of mine, silently omitted a passage in the last edition of his *Système du Monde.* I paid a visit the other day at Arcueil. Berthollet has a fine chateau seated on a bank amidst gardens, vineyards, &c.; and Laplace has another, little inferior, and adjoining to the grounds. I dine with Laplace next Sunday. Some person had informed him that I was the author of a critique in the *Edinburgh Review* on a paper of his, and he had sent an answer to me, which, however, I never received."[1] The following extract from another letter, written at Bordeaux, in the beginning of September, gives a rapid and lively sketch of his journey to that place:—"My tour has furnished what I wanted—a number of images of the milder and hotter regions of the Continent. From Paris I proceeded to Macon, over a rich and well-cultivated country, covered with wheat and vineyards, the crop for the most part already gathered in. Thence I descended the Somme, a fine, clear river, to Lyons; the banks covered with luxuriant vineyards stretching to a range of hills, and the waved surface sprinkled with trees, intermixed with frequent villages, and lively villas, all of white limestone. At Lyons I met with the celebrated Baron Zach, and was conducted by him in his carriage to the fountain of Vaucluse, Avignon, and thence to Marseilles. His society was particularly entertaining and instructive. We now passed through the country of the mulberry, the fig, and the olive; but I confess that Provence did not come up to my expectation. I have seen, what I had longed to see, the awful fountain of Vaucluse, and the blue expanse of the Mediterranean; but the shores at Marseilles are terminated by gray, naked rocks, shooting fantastically to great heights. I staid some days at Marseilles, and spent most of my time at a country house occupied by the old Duchess of Saxe-Gotha, with whom Baron Zach lives in quality of Chamberlain. I found her very kind and affable, and extremely glad to hear any news of the Royal Family of England. From Marseilles I returned to Avignon, and then crossing the Rhine, proceeded to Nismes, over a country extremely fertile and interesting. This is almost a Roman town. There is a temple to Augustus, beautifully Corinthian, a fine temple of Diana, and an amphitheatre almost entire, capable of holding twenty thousand spectators. I now proceeded to Montpellier, and saw the majestic range of the Pyrenees stretching on our left, and covered with eternal snow. Montpellier is an interesting place,—its Botanic Garden rich, and its promenades superb. I then proceeded to Toulouse. In leaving it, the carriage plunged into a hollow across the road; it was eleven at night, but the moon shone full, and lighted up a fine rich plain. I shuddered when told that we had just crossed five hundred dead bodies, which had been thrust into a cut or trench of the road, after the late battle. The road to Bordeaux runs near the course of the Garonne, through one of the finest and richest countries I have ever seen." From this place he returned to Paris, and, after a short stay, proceeded through the Netherlands to Rotterdam, where he took shipping for Scotland.

The publication of the *Supplement* to the three editions of this Encyclopædia immediately preceding the present one, commenced towards the close of 1815, and was continued progressively till its completion early in 1824. To that work, which was undertaken upon an unusually extensive plan, and which aimed at procuring the highest attainable assistance, Mr Leslie was throughout a Contributor. His contributions, surprisingly numerous when his other avocations are considered, display all the powers and attainments for which he was remarkable. Nor was it by his writings alone that he aided this publication. His advice, his invaluable information,—amazing alike for its minuteness and extent,—and his influence, were always at the service of its Editor, whose acknowledgment of these various obligations has long been before the public.[2] But it is due to Mr Leslie's memory to specify in this sketch of his life what the work owes to his genius and knowledge. Ranged in alphabetical order, his writings in it occur under the following heads: Achromatic Glasses; Acoustics; Aeronautics; Andes; Angle; Angle, trisection of; Arithmetic, palpable and figurate; Atmometer; Barometer; Barometrical Measurements; Climate; Cold and Congelation; Dew; Interpolation; Meteorology.[3]

Another work which at intervals enjoyed the benefit of his co-operation, was the *Edinburgh Review.* But his contributions, though commencing in the year 1809, were not numerous. They helped, however, and that in an eminent degree, to strengthen and diversify the scientific department of that Journal; whilst those regarding Voyages and Travels combine scientific observation with powers of writing of no ordinary description. Among his principal articles may be mentioned those on the Physical and Chemical Memoirs of the Society of Arcueil; on the history of the Barometer; on Delambre's work on the Arithmetic of the Greeks; on Von Buch's Travels; on Humboldt's Physical View of the Equatorial Regions, and on his Travels; and on the attempts to discover a North-West Passage to Asia. The picture in the last, of the revolving year, as observed within the arctic circle, is executed with a force of conception, as well as of colouring, that have not often been surpassed.

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[1] This must allude to a Paper by Laplace *On the Motion of Light in Diaphanous Media*, in the *Mémoires de la Societé d'Arcueil.* These Memoirs were reviewed by Professor Leslie, in two articles, in the fifteenth volume of the *Edinburgh Review*, published in 1810. They formed his first contributions to that Journal.

[2] See Preface to Supplement, p. 13.

[3] The present edition is enriched with the whole of these articles. That part of the article *Arithmetic*, which relates to palpable notation, has been omitted, with the exception of the curious disquisition on the *Abacus*, which is printed separately in this edition. The article *Interpolation* is, in it, annexed to that on Logarithms.

In the year 1819, a new field of professorial labour was opened to Mr Leslie, by the vacancy in the Chair of Natural Philosophy, occasioned by the death of one of the greatest ornaments of the University, Mr Playfair. Mr Leslie was on his return from one of his summer trips to the Continent when this lamented occurrence took place. The news met him on being put ashore at Largo, and is thus mentioned in a letter from that place, written on the first of August; in which he also describes an accident that had nearly, as he says, deprived the University of another Professor: "After having been detained for about a week in Holland, and after a tedious but agreeable passage of near ten days, I was at last put ashore here, from a sloop bound from Rotterdam to Grangemouth. Every thing looked joyous; but I had soon the tidings of poor Playfair's death, which was most unexpected and distressing. The loss to the university is severe.........I suspect that you were nearly deprived of two professors at once; for on Tuesday the 13th ultimo, I met with an alarming accident in Holland. I had passed the evening at a clergyman's with an intelligent merchant, late Provost of Aberdeen. On coming out of the house, at the end of the Boomtiges Street, or the street with rows of trees, the Maas running close, I stepped hastily forward to show him the Comet, and the quay being quite dark, I fell eight feet, and then plunged four feet in the water. This was the affair of an instant, and I felt that I was drowning; but I quickly recovered myself, and was helped out, with no damage but that of a bruise sustained in the fall." The eyes of the Patrons, and others interested in the University, were now turned to Mr Leslie, as the person best qualified to fill the vacant Chair. Two years before, when Mr Playfair was abroad, and an arrangement failed for carrying on the Class, Mr Leslie, at the very commencement of the session, unhesitatingly undertook the task for his absent colleague;[1] but, independently of this circumstance, his eminence in mathematical and physical science was such, that no one else could reasonably be thought of; and he accordingly was, without difficulty, appointed to the Chair; being thus a second time, but in more melancholy circumstances than on the former occasion, nominated a successor to his early friend.

The Chair to which he was thus unexpectedly called was unquestionably that for which he was best suited; and had he happened to be placed in it at the commencement of his professorial career, science in all probability would have derived greater benefits than she actually reaped from his powers. The time spent in his mathematical compositions would have been more profitably employed in that wider and richer province which he was so peculiarly qualified to cultivate. One of the first cares of his new situation was the extension of the Apparatus required for that greatly enlarged series of experiments which he thought necessary for the illustration of the Course. This, indeed, was an object of which, from the first to the last year of his incumbency, he never lost sight; and it is due to him to state, that it was through his exertions that the means of experimental illustration, in the Natural Philosophy Class, were for the first time made worthy of the place. Viewing him merely as a teacher, it must be admitted that he was not eminent. He was apt to forget, or rather did not perceive, that the connecting links between premises and conclusion, though familiar to the teacher, may, to the learner, be all unknown; that views quickly reached by the acquired perceptions of the one, must be opened up, step by step, to the yet imperfect vision of the other; and that it is the imperative duty of a public instructor to bring down knowledge from its highest spheres, and place it on a level adapted to the powers of unpractised understandings. His views of the nature of science were grand and animating; and his strictures on the great discoveries which constitute the epochs of its history, sometimes swelled into lofty strains of admiration; but, generally, in lecturing, as in writing, he wanted that consecution of thought, and that perspicuity of exposition, without which reasoning cannot be made intelligible, nor its conclusions satisfactory. Still, the attraction of his numerous experiments, the celebrity of his name, and the opinion entertained of his extraordinary powers, joined with great simplicity and affability of manner, concurred to secure him the respectful homage of his students, and to sustain the glory of the University. In 1823, he published, chiefly for the use of his class, a volume entitled *Elements of Natural Philosophy;* being the first of a Course intended to extend to three, and to exhibit a comprehensive view of the principles of that congeries of sciences which we are accustomed to class under the above term. Here, as was the case with his Mathematical Course, his plan was not completed; for he published no part of it but the volume mentioned, which includes only Mechanics and Hydrostatics. A second edition of this volume, corrected, and augmented with Notes, was published in 1829, three years before his death.

Mr Leslie had early determined to visit Italy at a fit opportunity; and he at last, in the summer of 1823, carried his design into execution. He set out with a mind still glowing with youthful enthusiasm, at the prospect of beholding the "eternal city;" but, whether from his entertaining too lofty conceptions, or from his view being too hurried and superficial, the tour, in as far at least as respected that crowning object of it, ended in disappointment. The following letter, written at Innsbruch on the 11th of August, contains a brief outline of his journey. "I have thus reached the frontiers of Germany on my return from Italy. I have fortunately achieved the principal objects of my tour; and though I have travelled slowly, I have seen a great deal in a short time. From Geneva I proceeded by Lausanne up the Valois to Brieg—thence crossed the Simplon, and descended through the plains of Lombardy to Milan. From this place I advanced by Parma and Modena to Bologna—next crossed the Appenines to Florence—again crossed another part of that broad chain to Rome. For various reasons, I made the 'eternal city' the limit of my journey. I therefore traversed the Appenines again to Ancona—skirted a considerable portion of the Adriatic—returned to Bologna, and thence proceeded to Mantua. I spent two days, about twenty miles from that place, at an old chateau, the residence of Acerbi, who accompanied me to Verona. Thence I went to Trent, and journeying through the Tyrol, have reached this spacious, interesting city. Italy has rather fallen below my expectations, whilst Switzerland has surpassed my early impressions. The passage of the Simplon alone is worth the journey; but the route through the Tyrol, though not so sublime, is highly picturesque. Italy has every thing on a grand scale. The plains, mountains, rivers, works of art, are all majestic and noble. But there is no comfort. Rome itself stands in the midst of a desert. Its grandeur has always been artificial—the result of force or fraud. I have seen whatever is most interesting; and I am inclined to differ very widely from our ordinary travellers. I heard much of the *malaria*, but I escaped untouched. I suffered little from the heat, and bore it better than the natives. Conformably to the custom, however, I was a sort of prisoner during a great part of the day—the windows shut to exclude every ray of light; and I was only called at times to look out, by the babbling chant of the Monks, with their torches and crosses, carrying the dead to their graves, and followed by the Charitable Brethren, like ghosts, apparelled in white sheets, with only holes for their eyes. They seemed better fitted to terrify the living than to comfort the dying." Two years after this, he made another tour on the Continent, in which he seems only to have gone over ground in France, the Netherlands, and Holland, which for the most part he had traversed before. This, we believe, was the last of his journeys abroad.

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[1] Mr Playfair expressed his gratitude, in very warm terms, for the promptness with which Mr Leslie, on this occasion, relieved him from what would have otherwise proved an unpleasant predicament; and it is but justice to the latter to mention the act, as showing that the placability of his nature, aided perhaps by the consciousness of intellectual power, had entirely obliterated those feelings which the somewhat severe critique of his *Geometry* in the *Edinburgh Review*, known to have been written by Mr Playfair, would have left to rankle, and produce the ordinary results, in a mind more irritable or less magnanimous.

The only important production of Mr Leslie's latter years was that which formed his crowning benefaction to this work—his Discourse on the *Progress of Mathematical and Physical Science during the eighteenth century;* which, with others of a similar description, constitute its first volume. The opening tribute to Mr Playfair, of whose history of the earlier progress of these sciences, this Discourse is a continuation, does honour alike to the writer's candour and taste. "The progress of mathematical and physical science during the brilliant period which closed with Newton and Leibnitz, has," he says, "been traced with fidelity and sustained interest by the hand of a master, whose calm judgment weighed impartially the different claims of discovery, whose powers of illustration could expand the fine results, and whose luminous eloquence was commensurate with the dignity of the subject." Nor is his observation on his own task less just; namely, that the more crowded field of discovery which it presents rendered it one of increased difficulty;—"its multifarious materials often lying scattered among the countless volumes of the Transactions of learned Societies." His arrangement of these materials, and his view of the whole subject, is comprehensive, vigorous, and spirited; and the greater ease and perspicuity of its style make this the most agreeable of all his writings.

The volumes of the *Edinburgh Philosophical Journal*, published between 1824 and 1829, contain some small contributions, which may be here mentioned as also belonging to his latter years. The first consists of *Remarks on the Light of the Moon and of the Planets;* the second, of an *Enumeration of the Instruments requisite for Meteorological observations;* the third, of a *Letter on the Coniometer;* and the last, of *Observations on the Theory of Compression, applied to discover the internal constitution of our Earth.* The characteristic boldness and poetical dress of his speculations are abundantly displayed even in these small productions. In the first of them, he endeavours to show that the moon is a *phosphorescent* substance, like the Bolognian stone; and he anticipates a period when "she will no longer cheer our nights by her soft and silvery beams; when she will become dim and wane, and seem almost blotted from the blue vault of heaven. To our most distant posterity," he adds, "this prospect is indeed gloomy; but other changes will arise to renovate and embellish the spectacle of the universe." In the last, he carries his reasonings to the startling conclusion, that the crust of the planet on which we tread includes "an immense concavity, not dark and dreary, as poets have fabled, but containing *light* in its most concentrated state, shining with intense refulgence and overpowering splendour!"

Early in the year 1832, which unhappily proved to be that of his death, he was, on the recommendation, we believe, of Lord Brougham, then Lord High Chancellor, created a Knight of the Guelphic Order. This honour was also conferred on several other distinguished men of science, at the same time. In a letter mentioning this occurrence, he says, "my holiday title is now of course Sir John; but I shall always retain an affection for my old distinction of PROFESSOR." He had but few other titular distinctions of any sort; for he was far from setting any value on those arising from fellowship with Scientific Bodies. He was a member of the Royal Society of Edinburgh, but not of that of London. The only distinction of this kind that he in the least degree prized was his being elected a Corresponding Member of the Royal Institute of France. This took place, with honour, in 1820; the choice, if we recollect rightly, having fallen upon him, in preference to others then proposed, by a majority of thirty-three out of thirty-seven votes.

For a few years before the fatal one above mentioned, his occupations had been agreeably diversified, by his attention to the improvement of a small estate, called Coates, situate near his native place, of which he made a purchase. Here, the house and garden being every way commodious and suitable, and surrounded with scenes endeared by his earliest recollections, he loved to reside; and even those of his friends who most regretted that his precious time should be wasted on rural occupations, could not but sympathise with his feelings, and rejoice that the honourable labours of the Philosopher had enabled him to secure such a retreat. No one could enjoy more vigorous or constant health; and though of a corpulent habit of body, he was exceedingly active, and fond of exercise. His strength, and the longevity of his family—a circumstance on which he himself founded flattering hopes—alike gave promise of longer life; and it is melancholy to think that its close was but too probably hastened by one of his foibles—a contempt for medicine, and an unwillingness to think that he could be seriously ill. In the last days of October, whilst engaged in superintending some improvements on his grounds, he exposed himself to wet, and caught a severe cold. This was followed by erysipelas in one of his legs, which he neglected, and again imprudently exposed himself in the fields. He soon afterwards became dangerously ill, and expired at Coates, on the evening of Saturday the third of November 1832, in the sixty-seventh year of his age.

It has been well observed by Dr Johnson, that "of every great and eminent character, part breaks forth into public view, and part lies hid in domestic privacy. Those qualities which have been exerted in any known and lasting performances, may, at any distance of time, be traced and estimated; but those peculiarities which discriminate every man from all others, if they are not recorded by those whom personal knowledge enabled to observe them, are irrecoverably lost."[1] To prevent "this mutilation of character," as the same writer calls it, we shall close our narrative with a few details more particularly illustrative of the mind, opinions, and dispositions of this remarkable person. His discoveries, and the facts and controversies connected with them, may be discussed by many; and the full detail of them would require more space than can here be afforded; but, having enjoyed all the advantages for observation which long and intimate "personal knowledge" alone can supply, we think it right to endeavour, though briefly, to prevent some characteristic features from being "irrecoverably lost." The portrait may be imperfect; we cannot, indeed, complete it to our own satisfaction on our narrow canvass; but, in as far as the sketch extends, we can honestly say that it is faithfully copied from nature.[1]

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[1] Johnson's *Life of Sir Thomas Browne.*

It would be impossible, we think, for any intelligent and well-constituted mind, thoroughly acquainted with the powers and attainments of Sir John Leslie, to view them without a strong feeling of admiration for his vigorous and inventive genius, and of respect for that extensive and varied knowledge, which his active curiosity, his excursive reading, and his happy memory, had enabled him to amass and digest. Some few of his contemporaries in the same walks of science may have excelled him in profundity of understanding, in philosophical caution, and in logical accuracy; but we doubt if any surpassed him, whilst he must be allowed to have surpassed most, in that creative faculty —one of the highest and rarest of nature's gifts—which leads to and is necessary for discovery, though not all-sufficient of itself for the formation of safe conclusions; or in that subtilty and reach of discernment which seizes the finest and least obvious qualities and relations of things—which elicits the hidden secrets of nature, and ministers to new and unexpected combinations of her powers. "Discoveries in science," says he, in one of his works, "are sometimes invidiously referred to mere fortuitous incidents. But the mixture of chance in this pursuit should not detract from the real merit of the invention. Such occurrences would pass unheeded by the bulk of men; and it is the eye of genius alone that can seize every casual glimpse, and discern the chain of consequences." With genius of this sort he was richly gifted. Results overlooked by others were by him perceived with a quickness approaching to intuition. To use a poetical expression of his own, they seemed "to blaze on his fancy." He possessed the inventive in a far higher degree of perfection than the judging and reasoning powers; and it thus sometimes happened, that his views and opinions were not only at variance with those of the majority of the learned, but inconsistent with one another. Notwithstanding the contrary testimony, explicitly recorded, of the founders of the English Experimental School, he denied all merit and influence to the labours of the immortal delineator of the Inductive Logic. He freely derided the supposed utility of Metaphysical Science, without perceiving that his own observations on *Causation* virtually contained the important admission, that physical is indebted to mental philosophy for the correct indication of its legitimate ends and boundaries. His writings are replete with bold and imaginative suppositions; yet he laments the "ascendancy which the passion for hypotheses has obtained in the world."[2] His credulity in matters of ordinary life was, to say the least of it, as conspicuous as his tendency to scepticism in science. It has been profoundly remarked by Mr Dugald Stewart, that "though the mathematician may be prevented, in his own pursuits, from going far astray, by the absurdities to which his errors lead him, he is seldom apt to be revolted by absurd conclusions in other matters." "Thus, even in physics," he adds, "mathematicians have been led to acquiesce in conclusions which appear ludicrous to men of different habits." Something of this sort was observable in the mind of this distinguished mathematician. He was apt, too, to indulge in unwarrantable applications of mathematical reasoning to subjects altogether foreign to the science; as when he finds an analogy between circulating decimals and the lengthened cycles of the seasons! But when the worst has been said, it must be allowed that genius has struck its captivating impress over all his works. Whether his bold speculations lead him to figure the earth as enclosing a stupendous concavity filled with light of overpowering splendour; or to predict the moon's arrival at an age when her "silvery beams" will become extinct; or to ascribe the phenomena of radiated heat to aërial pulsations; we at least perceive the workings of a decidedly original mind. This, however, is not all. His theoretical notions may be thrown aside or condemned; but his exquisite instruments, and his experimental combinations, will ever attest the utility no less than the originality of his labours, and continue to act as helps to farther discovery. We have already alluded to the extent and excursiveness of his reading. It is rare, indeed, to find a man of so much invention, and who himself valued the inventive above all the other powers, possessing so vast a store of information. Nor was it in the field of science alone that its amplitude was conspicuous. It was so in regard to every subject that books have touched upon. In Scottish history, in particular, his knowledge was alike extensive and accurate; and he had, in acquiring it, gone deep into sources of information—such as parish records, family papers, and criminal trials—which ordinary scholars never think of exploring. The ingenious mathematician, the original thinker, the rich depositary of every known fact in the progress of science, would have appeared to any one ignorant of his name and character, and who happened to hear him talk on this subject, as a plodding antiquary; or, at best, as a curious and indefatigable reader of history, whom nature had blessed with at least one strong faculty, that of memory. His conversation showed none of that straining after "thoughts that breathe, and words that burn," so conspicuous in his writings. In point of expression, it was simple, unaffected, and correct. Though he did not shine in mixed society, and was latterly unfitted, by a considerable degree of deafness, for enjoying it, his conversation, when seated with one or two, was highly entertaining. It had no wit, little repartee, and no fine turns of any kind; but it had a strongly original and racy cast, and was replete with striking remarks and curious information.

Viewing the whole of his character, moral and intellectual, it must be confessed that it presented some blemishes and defects. He had prejudices, of which it would have been better to be rid; he was not over charitable in his views of human virtue; he was not so ready, on all occasions, to do justice to kindred merit as was to be expected in so ardent a worshipper of genius; and his care of his fortune went much beyond what is seemly in a philosopher. But his faults were far more than compensated by his many good qualities;—by his constant equanimity, his cheerfulness, his simplicity of character almost infantile, his straightforwardness, his perfect freedom from affectation, and, above all, his unconquerable good nature. He was, indeed, one of the most placable of human beings; and, notwithstanding his general attention to his own interest, it is yet undeniable, that he was a warm and good friend, and a relation on whose affectionate assistance a firm reliance ever could be placed. He was fond of society, and greatly preferred and prized that of the intelligent and refined; but no man ever was more easily pleased; no fastidiousness ever interfered with his enjoyment of the passing hour; he could be happy, and never failed to converse in his usual way, though in the humblest company; and we have often known him pass an afternoon with mere boys, discoursing to them pleasantly upon all topics that presented themselves, just as if they had been his equals in age and attainments. He was thus greatly liked by many who knew nothing of his learning or science, except that he was famous for both.

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[1] The substance of some of the following observations appeared in the Newspapers immediately after the death of Sir John Leslie. They may, without impropriety, be used here, by the pen from which they originally proceeded.

[2] See Introduction *to Elements of Natural Philosophy*.

He was never married. As to his person,—he was somewhat under the middle size, and corpulent, but strong and well limbed; and though his face was large and florid, there was that about his eyes and forehead which seemed to show that he was no ordinary man. There is a Bust of him by Joseph; a Portrait of the ordinary size, taken a few years before his death, by Wilkie; and a Head, drawn at an earlier period, by Henning, which presents a striking likeness.

LESNAIA Reka, a river of Asiatic Russia, which flows through the government of Tobolsk, in Russia. Its course is towards the north, and it flows into the Frozen Ocean.

LESPARRE, an arrondissement of the department of the Gironde, in France, 742 square miles in extent. It contains four cantons, which are divided into thirty-seven communes, and it is peopled by 32,500 inhabitants. The capital is a town of the same name, situated on a swampy spot, whence a brook runs to the Gironde. It has 200 houses, and 1050 inhabitants.

LESSER Tone, in *Music*. See Tone.

LESSINA, a large island in the Adriatic Sea, being a part of the Austrian province of Dalmatia. It extends over 396 square miles, and contains one city, three market-towns, and thirty villages, with 8819 inhabitants. Although the surface is both woody and mountainous, it has some beautiful and productive valleys, yielding in abundance wine, olives, figs, and almonds, and an adequate supply of corn. Much of the wine is exported. The Sardinia fishery is a profitable branch of industry. The capital is a town of the same name, containing a castle, a cathedral, and 1237 inhabitants.

LESSINES, a city of the Netherlands, in the province of Hennegau, and arrondissement of Tournay, situated on the left bank of the Dender. It contains 3800 inhabitants, and has several breweries, distilleries, tanneries, and oil-mills. Long. 3. 43. E. Lat. 51. 41. N.

LESSOE, an island belonging to the Danish province of Aaland. It is situated in the Cattegat, and contains, in three parishes, 1570 inhabitants, who subsist partly by fisheries and by pilotage. Long. 10. 45. E. Lat. 57. 23. N.

LESSONS, amongst ecclesiastical writers, portions of the Holy Scripture, which were read in Christian churches at the time of divine service.

In the ancient church, reading the Scriptures was one part of the service of the catechumens, at which all persons were allowed to be present, in order to obtain instruction.

L'ESTRANGE, Sir Roger, a well-known writer of the seventeenth century, was descended from an ancient family of Hunstanton Hall, in the county of Norfolk, where he was born in 1616, being the youngest son of Sir Hammond l'Estrange, a zealous royalist. Having in 1644 obtained a commission from Charles I. for reducing Lynn in Norfolk, then in possession of the parliament, his design was discovered, and his person seized. He was tried by a court-martial at Guildhall in London, and condemned to death as a spy; but he was subsequently reprieved, and continued in Newgate for some time. He afterwards went beyond sea; but in August 1653 returned to England, where he applied himself to the protector, Cromwell, and having once played before him on the bass-viol, he was by some nicknamed "Oliver's fiddler." Being a man of parts, master of an easy, humorous style, and withal in narrow circumstances, he established a newspaper, under the title of *The Public Intelligencer*, in 1663; but upon the publication of the first London Gazette in 1665, he discontinued it, having been allowed a compensation by government. Some time after the Popish plot, when the Tories began to gain the ascendency over the Whigs, he, in a paper called the *Observator*, became a zealous champion of the former. He was afterwards knighted, and served in the parliament called by James II. in 1685. But things taking a different turn in that prince's reign, in point of liberty of conscience, from what most people had expected, his *Observators* were discontinued, as not being at all suited to the times. However, he continued licenser of the press until the accession of King William III., in whose reign he met with some trouble, from being considered a disaffected person. However, he went down to his grave in peace, after he had in a manner survived his intellects. He published a great many political tracts, and translated from the Greek, Latin, and Spanish, the works of Josephus, Cicero's Offices, Seneca's Morals, Erasmus's Colloquies, Æsop's Fables, and Bonas's Guide to Eternity. The character of his style has been variously represented; his language being considered by some as easy and humorous, whilst others conceive that his productions are not fit to be read by any who have pretensions to taste or good breeding.

LETCHLADE, a market-town in the hundred of Brightwells Barron, in Gloucestershire, seventy-six miles from London. It has some trade, from standing on the canal which joins the Thames with the Severn. There is a market on Tuesday. The population amounted in 1801 to 917, in 1811 to 993, in 1821 to 1154, and in 1831 to 1244.

LETHARGY, in *Medicine* (from ληθη, *oblivion*, and ἀργια, *numbness, laziness*), a disease consisting of a profound drowsiness or sleepiness, from which the patient can scarcely be awaked; or, if awaked, he remains stupid, without sense or memory, and presently sinks again into his former sleep.

LETHE (from λανθανω, *to hide* or *conceal*), in the ancient mythology, one of the rivers of hell, signifying oblivion or forgetfulness; its waters, according to poetic fiction, having the peculiar quality of making those who drank them forget everything that was past.

LETI, Gregorio, an eminent Italian writer, was descended of a family which once made a considerable figure at Bologna. Jerom, his father, was page to Prince Charles de' Medicis; served some time in the troops of the grand duke as captain of foot; and married at Milan, where he settled in 1628. He was afterwards governor of Almantea in Calabria, and died at Salerno in the year 1639. Gregorio was born at Milan in 1630, studied under the Jesuits at Cosenza, and was afterwards sent to Rome by an uncle, who wished him to enter the church; but he being averse to this, proceeded to Geneva, where he studied the principles of religion and government. Thence he went to Lausanne; and having contracted an acquaintance with John Anthony Guérin, an eminent physician, lodged at his house, made profession of the Calvinist religion, and married his daughter. He settled at Geneva, where he spent nearly twenty years, carrying on a correspondence with learned men, especially with those of Italy. Some contests obliged him to leave that city in 1679; upon which he went to France, and then to England, where he was received with great civility by Charles II. who, after his first audience, made him a present of a thousand crowns, and promised him the place of historiographer. Whilst in England, he wrote a history of that country; but as this work displeased the court, on account of his too great liberty in writing, he was ordered to leave the kingdom. He went to Amsterdam in 1682, and was honoured with the place of historiographer to that city. Leti died suddenly in 1701. He was a man of indefatigable application, as is evinced by the multiplicity of his works. The principal of these are, 1. The Universal Monarchy of Louis XIV.; 2. The Life of Pope Sixtus V.; 3. The Life of Philip II. King of Spain; 4. The Life of the Emperor Charles V.; 5. The Life of Elizabeth, Queen of England; 6. The History of Oliver Cromwell; 7. The History of Great Britain, in five vols. 12mo; 8. The History of Geneva; besides other works.

LETRIM, a county of Ireland. See LEITRIM.

LETTER, a character used to express one of the simple sounds of the voice. As the different simple sounds are expressed by different letters, these, by being differently compounded, become the visible signs or characters of all the modulations and varieties of sound used to express our ideas in a regular language. Thus, by the help of speech we render our ideas audible; by the assistance of letters we render them visible; and by means of these we can wrap up our thoughts, and send them to the most distant parts of the earth, or read the transactions of different ages. What letters were originally, who first invented them, and amongst what people they were primarily used, there is still reason to doubt. Philo attributes this great and noble invention to Abraham; Josephus, St Irenæus, and others, to Enoch; Bibliander, to Adam; Eusebius, Clemens Alexandrinus, Cornelius Agrippa, and others, to Moses; Pomponius Mela, Herodian, Rufus Festus, Pliny, Lucan, and others, to the Phœnicians; St Cyprian, to Saturn; Plato and Tacitus, to the Egyptians; some, to the Ethiopians; and others, to the Chinese, who cannot possibly be entitled to this honour, since all their characters are the signs of simple ideas, and have nothing in common with letters.

There have also been various conjectures respecting the different kinds of letters used in different languages. Thus, according to Crinitus, Moses invented the Hebrew letters; Abraham the Syriac and Chaldaic; the Phœnicians those of Attica, brought into Greece by Cadmus, and thence carried into Italy by the Pelasgians; Nicostrata, the Roman; Isis, the Egyptian; and Vulfilas, those of the Goths. These, however, are but fanciful conjectures, which it is sufficient to state, and would be vain to examine or discuss.

The natural order of invention, in the visible representation of thought, seems to be indicated, not merely by theory, but by facts ascertained from the analysis of ancient graphic remains, as well as by the practice actually followed amongst several existing nations. The primary and elemental form was unquestionably that of picture-writing, or the delineation, more or less rude, of external objects, as these present themselves to the eye; with perhaps some marks expressive of *day*, *week*, *month*, *year*, and even of *time* generally. The next was the hieroglyphic or ideagraphic form, which consisted not only of pictures or resemblances of external objects, but also, and in a much larger proportion, of images metaphorically or analogically transferred, so as to become signs of other things, and to indicate general notions as well as simple ideas. This was no doubt a very great improvement on picture-writing, inasmuch as it gave considerable extension and variety to the power of expression, and enabled mankind, though in a laborious form, to write their annals, inscribe their monuments, and preserve what knowledge they had acquired. The third and the last step in the gradual improvement of writing, was the invention of letters; that is, of signs or marks expressive, not of ideas whether simple or complex, but of the elementary sounds of the human voice. This was the ultimate term, the final generalization, which led to the greatest and happiest of all discoveries, that of a literal alphabet.

It is no doubt true that some nations appear to have stopped short before reaching this final term, and to have remained satisfied with a more elaborate and imperfect mode of graphic representation. The Mexicans, for instance, had not advanced beyond picture-writing, in its rudest and simplest form. The Chinese have, for ages, employed a multitude of ideagraphic characters, derived, by composition and otherwise, from a limited number of elementary pictures or representations of external objects, without making the least step towards an alphabet, on the very verge of which invention they stand as often as they employ their ideagraphic characters, phonetically, to express the sounds of a foreign proper name. The ancient Egyptians also remained contented with their hieroglyphical system; and although Plato attributes to their god Thoth the invention of letters, the honour of that discovery appears rather to have belonged to other nations, who were not trammelled by habit, or restrained by prejudice, from attempting to improve their method of written expression. But it does not follow from this, as some have pretended, that letters are not derivable from ideagraphic signs, because some nations had not the ingenuity to make the derivation. It might with as much reason be maintained, that the law of universal gravitation is not deduceable from the fact of the descent of heavy bodies in a line directed towards the centre of the earth, because the deduction was not fully made, and clearly established, until the time of Newton. The Egyptians, like the Chinese, as often as they had occasion to write a foreign proper name, employed their ideagraphic characters phonetically, that is, as alphabetical letters expressive of *sounds* merely; in other words, the very exigencies of their graphic system forced upon them the knowledge and the practice of an alphabet, to the extent here indicated. They were, therefore, upon the very threshold of the discovery; necessity itself had impelled them in the right direction; the slightest attempt at generalization would have led them to the grand consummation; and, if they had tried to do that, generally, which they found themselves obliged to do in particular cases, the result would have been the displacement of ideagraphic by alphabetic characters. But does it follow, because they failed to make this final step, that the invention of letters was not the natural result of that state of things which immediately preceded it; or that alphabetic writing is not an invention of man, but "a miraculous gift to him from God," as Dr Wall of Dublin and some others contend?

This seems to be not only unphilosophical in an eminent degree, but likewise absurd and preposterous. For if it required a miracle to deduce letters from hieroglyphics, it must have equally required one to deduce hieroglyphics, in all their complex variety of tropical, kuriological, and anaglyphic, from mere imitative representations, such as were found in use amongst the Mexicans when the Spaniards first landed in the New World. The distance between the Mexican and the Egyptian systems is fully as great as, if not greater than, the distance between phonetic hieroglyphics and the alphabet of Cadmus. If we were always to presume the interposition of miraculous agency in cases where men failed to reach inventions or discoveries, upon the very borders of which they had been standing for ages, history would become a romance, and philosophy a manual of superstition. The order of nature is not thus dislocated and disturbed; nor does the ordinary progress of invention, improvement, and generalization require to be accounted for or explained by supposititious assumptions of supernatural interposition. The miracle connected with the invention of an alphabet is its extreme simplicity, united with the almost unlimited power which it gives to man of expressing his thoughts in writing.

Letters constitute the first or elementary part of grammar; and they are combined, first, into syllables, secondly, into words, and, thirdly, into sentences. The alphabet of every language consists of a certain number of letters, which ought to have each a different sound, figure, and use. As the difference of articulate sounds was intended to express the different ideas of the mind, so one letter was originally intended to signify only one sound, and not, as at present, to express sometimes one sound, and sometimes another; a practice which has brought a great deal of confusion into languages, and rendered the acquisition of the modern tongues much more difficult than it would otherwise have been. This consideration, together with the defects of all the known alphabets, from their wanting certain letters to express certain sounds, has occasioned several attempts to form an universal alphabet, containing an enumeration of all the single sounds or letters which are used in any language.

Grammarians distinguish letters into vowels, consonants, mutes, liquids, diphthongs, and characteristics. They receive their denomination from the shape and turn which is given to them; and in writing are distinguished into different hands, as round text, German text, round hand, Italian, and so forth; and in printing, into Roman, Italic, and black letter.

The term Letter, or *Type*, amongst printers, not only includes the capitals, small capitals, and small letters, but all the points, figures, and other marks cast and used in printing; and also the large ornamental letters cut in wood or metal, which are employed instead of the illuminated letters used in manuscripts. The letters used in printing are cast at the ends of small pieces of metal, about three quarters of an inch in length; and the letter being not indented, but raised, easily gives the impression, when, after being blacked with a glutinous ink, paper is closely pressed upon it. (See the article Printing.) A fount of letters includes small letters, capitals, small capitals, points, figures, spaces, and other necessary adjuncts. See Fount.

Letter is a writing directed and sent by one person to another. See Epistle.

The art of epistolary writing was considered by the Romans amongst the number of polite and liberal accomplishments; and we find Cicero mentioning, with great pleasure, in some of his letters to Atticus, the elegant specimen he had received from his son of his genius in this way. It seems indeed to have formed part of their education; and, in the opinion of Mr Locke, it well deserves to have a share in ours. The writing of letters enters so much into all the occasions of life, that no gentleman can avoid showing himself in compositions of this kind. Occurrences will daily force him to make this use of his pen, which lays open his breeding, and sense, and his abilities, to a severer examination than any oral discourse.

Purity in the choice of words, and justness of construction, joined with perspicuity, are the leading properties of the epistolary style. Accordingly, Cicero says, "In writing letters, we make use of common words and expressions;" and Seneca observes, "I would have my letters to be like my discourses, when we either sit or walk together, unstudied and easy." For what prudent man, in his common discourse, aims at bright and strong figures, beautiful turns of language, or laboured periods? Nor is it always requisite to attend to exact order and method. He who is master of what he writes, will naturally enough express his thoughts without perplexity and confusion; and anything more than this is seldom necessary, especially in familiar letters.

As the subjects of epistles are exceedingly various, they necessarily require corresponding variety in the manner of expression. If the subject be something weighty and momentous, the language should be strong and solemn; in things of an inferior description, free, easy, and familiar; and upon lighter matters, jocose and pleasant. In exhortations, it ought to be lively and vigorous; in consolations, kind and compassionate; in admonition, grave and serious. In narratives, it should be clear and distinct; in requests, modest; in commendations, friendly; in prosperity, cheerful; in adversity, mournful, but not mean or desponding. In a word, the style ought to be accommodated to the particular nature of the subject concerning which it is the object of the writer to express his sentiments and feelings.

Letter of Attorney, in *Law*, is a writing by which one person authorizes another to do some lawful act in his stead.

Letter of Marque. See Marque.

Letters Patent or *Overt*, are writings sealed with the great seal of England, by which a man is authorized to do or to enjoy any thing exclusively for a period of time, which, of himself, he could not do without such authority. They are so called by reason of their form, as being open, with the seal affixed, ready to be shown for the confirmation of the authority given by them.

LETTITSCHEW, a circle of the province Podolia, in Russia. It extends in north latitude from 49. 6. to 49. 37. and in east longitude from 25. 9. to 27. 52. It is well watered by the Bug and the Wotschik, and has many extensive forests, with some fertile soil. The capital, a city of the same name, is 950 miles from Petersburg; it is situated on the Wotschik, and has one Catholic and two Greek churches, 380 houses, and 1860 inhabitants. Long. 27. 39. E. Lat. 40. 22. 30. N.

LEUCA, in *Antiquity*, a geographical measure of length, in use amongst the later Gauls, and which, according to Jornandes, who calls it *leuga*, contained fifteen hundred paces, or one mile and a half. Hence the name of *league*, in the lower age called *leuva*, and now reckoned at about three miles.

LEUCATA, or Leucate, in *Ancient Geography*, a promontory of Leucadia, being a white rock projecting into the sea towards Cephalonia, on which stood a temple of Apollo surnamed *Leucadius*. At the festival which was annually celebrated here, the people were accustomed to offer an expiatory sacrifice to the god, to avert all the calamities with which they might be threatened. For this purpose they made choice of a criminal condemned to death, whom, having conducted to the brink of the promontory, they precipitated into the sea amidst the loud shouts of the spectators. The criminal, however, seldom perished in the water; for it was the custom to cover him with feathers, and to fasten birds to his body, which by spreading their wings served to break his fall. No sooner did he touch the sea, than a number of boats stationed for the purpose flew to his assistance, and drew him out; but after being thus saved, he was banished for ever from the territory of Leucadia.

According to ancient authors, a strange opinion concerning this promontory prevailed for some time amongst the Greeks. They imagined that the leap of Leucate was a potent remedy against the violence of love. Hence disappointed or despairing lovers, it is said, were often known to go to Leucadia, and, having ascended the promontory, and offered sacrifices in the temple, and engaged by a formal vow to perform the desperate act, to precipitate themselves into the sea. Some are reported to have recovered from the effects of the fall; and, amongst these, mention is made of a citizen of Buthroton, in Epirus (Butrinto, in Albania), whose passions always taking fire at new objects, had four times recourse to the same remedy, and always with success. As those who made the trial, however, seldom took any precaution to render their fall less rapid, they were generally destroyed; and women often fell victims to this act of superstitious desperation. At

Leucate was shown the tomb of Artemisia, the celebrated queen of Caria, who gave so many proofs of courage at the battle of Salamis. Inflamed with a violent passion for a young man who inflexibly refused her love, she surprised him in his sleep, and put out his eyes. But regret and despair soon drove her to Leucate, where she perished in the waves, notwithstanding that every effort was made to save her. Such likewise was the end of the unhappy Sappho. Forsaken by her lover Phaon, she went thither to seek relief from her sufferings, and found it in destruction.

LEUCIPPUS, a celebrated Greek philosopher, respecting the exact period of whose birth and death we are ignorant. Neither is his birth-place known; but Diogenes Laertius, who furnishes us with a few facts respecting him, states that he was a native either of Velia in Italy, Abdera, or Miletus. According to Jamblichus, he had in his youth attended Pythagoras; he was the disciple of Melissus, and of Zeno of Velia, which confirms the supposition that he must have flourished about B. C. 430. He was the first who invented the system of atoms, which was afterwards more fully explained by Democritus and Epicurus. Posidonius (Strab. xvi. 512) ascribed the honour of this invention to Moschus, a Phœnician philosopher, who lived, it is said, before the siege of Troy; but there seems little reason to believe that this statement is correct. Several other philosophers had, before the time of Leucippus, considered matter as divisible into indefinitely small particles; but Leucippus and Democritus were the first who taught that these particles were originally destitute of all qualities except figure and motion. According to this theory, the universe, which is infinite, is in part a *plenum* and in part a *vacuum*. The *plenum* contained innumerable corpuscles or atoms of various figures, which, falling into the *vacuum*, struck against each other; and hence arose a variety of curvilinear motions, which continued, till at length atoms of similar forms met together, and bodies were produced. The primary atoms being specifically of equal weight, and not being able, on account of their multitude, to move in circles, the smaller rose to the exterior parts of the vacuum, whilst the larger, entangling themselves, formed a spherical shell, which revolved about its centre, and which included within itself all kinds of bodies. The central mass was gradually increased by a perpetual accession of particles from the surrounding shell, till at last the earth was formed. Lactantius has ably refuted the hypothesis of Leucippus (*Instit. Divin.* iii. 17.) (See a Memoir of Batteux on the Active Principle of the Universe, *Mém. de l'Acad. des Inscrip.* xxix.; also Montucla, *Hist. des Math.* i. 147; and Bayle, *Dictionaire.*)

LEUCOMA, in *Antiquity*, was a public register amongst the Athenians, in which were inserted the names of all the citizens as soon as they were of age to enter upon their paternal inheritance.

LEUCOPETRIANS, in *Ecclesiastical History*, the name of a fanatical sect which sprang up in the Greek and eastern churches towards the close of the twelfth century. The fanatics of this denomination professed to believe in a double trinity; rejected wedlock; abstained from flesh; treated with the utmost contempt the sacraments of baptism and the Lord's supper, with all the various branches of external worship; placed the essence of religion in internal prayer alone; and maintained that an evil being or genius dwelt in the breast of every mortal, and could be expelled thence by no other method than by perpetual supplication to the Supreme Being. The founder of this sect of enthusiasts is said to have been a person called Leucopetrus, and his chief disciple Tychicus, who corrupted, by fanatical interpretations, several books of Scripture, particularly St Matthew's Gospel.

Leucothoe
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Leuwenhoeck.

LEUCOTHOE, or LEUCOTHEA, in fabulous history, the wife of Athamas, who was changed into a sea deity. She was the Matuta of the Romans, and had a temple at Rome, where all the people, particularly women, offered vows for their brothers' children. They did not entreat the deity to protect their own children, because Ino had been unfortunate in hers. No female slaves were permitted to enter the temple; or if curiosity tempted them to transgress this rule, they were beaten with the greatest severity.

LEUCTRA, in *Ancient Geography*, a town of Bœotia, to the west of Thebes, situated between Platæa and Thespia, where the Lacedæmonians sustained a terrible defeat by the Thebans under Epaminondas and Pelopidas. See SPARTA.

LEUSDEN, JOHN, a celebrated philologist, born in 1624. He studied the learned languages and mathematics at Utrecht, and then went to Amsterdam to converse with the rabbin, and perfect himself in the Hebrew tongue; after which he became professor of Hebrew at Utrecht, where he acquired a great reputation, and died in the year 1699. He wrote many valuable works, the principal of which are, 1. Onomasticum Sacrum, 8vo; 2. Clavis Hebraica et Philologica Veteris Testamenti, 4to; 3. Novi Testamenti Clavis Græca, cum Annotationibus Philologicis, 8vo; 4. Compendium Biblicum Veteris Testamenti, 8vo; 5. Compendium Græcum Novi Testamenti, the best edition of which is that of London, in 1668, 12mo; 6. Philologus Hebræus, 4to; 7. Philologus Hebræo-mixtus, 4to; 8. Philologus Hebræo-Græcus, 4to; 9. Notes on Jonas, Joel, Hosea, and other books. He also gave correct editions of several learned works.

LEUTMERITZ, a circle in the Austrian kingdom of Bohemia, extending over 1394 square miles, containing forty-two cities and towns, 942 villages, and 54,060 houses, inhabited by 300,711 individuals. It is a romantic district of hills, covered with wood, and narrow valleys of considerable natural fertility. The Elbe carries off the waters of the many small streams which run through the valleys. It is productive of corn, flax, hops, fruit, and yields some wine, and may be considered as a granary for part of the kingdom of Saxony. The capital, from which the circle derives its name, is a city situated on the Elbe, and surrounded with walls and ditches. It has a magnificent cathedral and eleven other churches, a town-hall, 565 houses, and 3950 inhabitants. Long. 13. 1. 33. E. Lat. 50. 31. 38. N.

LEUTSCHAU, a city of the circle of Zips, in the province of Hither Theiss, in Hungary. It is unfortified, and irregularly built, has a Catholic and a Lutheran church, and contains 866 houses, with 4340 inhabitants. It has much trade in brewing and distilling, and in wine, and is much frequented by pilgrims, who visit there an image of the Virgin Mary. Long. 20. 21. 5. E. Lat. 49. 0. 58. N.

LEUWENHOECK, ANTONY, a celebrated naturalist, was born at Delft in the year 1632, and died on the 26th of August 1723. The peculiar talent he displayed in cutting glasses for microscopes and spectacles at first procured him much reputation, owing to the superiority of the instruments he constructed; and he afterwards acquired still higher distinction as a naturalist and anatomist, by the variety of his researches on the internal structure of the different parts of the human body. His microscopical labours and observations were so numerous, that it would be impossible to give an exact detail of them; we shall, therefore, advert only to his principal researches. The antagonists of Harvey, author of the discovery of the circulation of the blood, objected to the doctrine of this great anatomist, that if the blood passed directly from the arteries to the veins, it could not nourish the parts it traversed. The question was undecided; and, in 1686, Leuwenhoeck com-

Leuwenhoeck.

municated to the Royal Society of London a memoir, in which, contrary to the opinion of Harvey, he maintained that the passage of the blood from the arteries to the veins was not immediate. Nevertheless, in 1690, having scrupulously re-examined the parts with his improved microscope, he discovered and demonstrated in the clearest manner the continuity of the arteries with the veins; and he even refused to admit any division between the capillary vessels, because, said he, it is impossible to determine where the arteries end and the veins begin. At this period, the chemical theory which prevailed in medicine assumed as certain the fermentation of the blood. Leuwenhoeck combated this hypothesis successfully, opposing to it his microscopic experiments, from which it results that there exist no bubbles of air in the blood-vessels, a phenomenon which ought to occur if the blood underwent fermentation. This experimenter having also directed his researches to the form of the globules of blood which Malpighi had already perceived, showed that these globules are oval and flattened, being composed of six small cones which float in the *serum*, and which, taken separately, do not reflect the red colour, but which, by their union, communicate to the blood the physical qualities it is known to possess. This discovery served as the basis of the theory of Boerhaave on inflammation. In order to support his system, Leuwenhoeck showed that the red capillary vessels proceed from other vessels, where the circulation of the blood takes place beyond the influence of the heart, and where this liquid appears white, because its globules are divided, in order to accommodate themselves to the tenuity of the canals through which it must pass. Ulterior experiments have not confirmed his ideas as to the physical composition of the blood; but his observations on the structure of the capillary vessels have been recognised as exact by the most enlightened anatomists. The brain and the nerves formed also subjects of research to Leuwenhoeck. He pretended that the cortical substance is entirely vascular; that the vessels which compose it are five hundred and twelve times smaller than the most attenuated capillary vessels; and that the globules composing the fluid contained in the cortical substance are thirty-six times smaller than those of which the red blood is formed. Lastly, he conceived that each of these globules is surrounded with a very fine reticulation of vessels and of fibres. But new experiments made in 1717 induced him to modify his ideas; and he then alleged that the brain is a fibrous structure, and that blood-vessels are intertwined amongst the fibres composing that organ. Science, however, has derived no advantage from these last researches, which are more fitted to perplex than to enlighten. Leuwenhoeck studied the structure of the crystalline lens, and described, with accuracy, the coats which compose this part of the organ of vision; adding very good figures to his description. Much has been said of the discovery of the animalcules which he perceived in the sperm. He described these minute bodies at great length, and conjectured that, having reached the uterus, they irritate that organ, attract the ovum, and communicate vitality to the embryon contained in it. Benjamin Martin has contested these observations, a detail of which may be found in the Natural History of Buffon. Leuwenhoeck employed his whole life, which was very long, in making anatomical observations and experiments; and he only wanted, to obtain more numerous results, that erudition and sagacity which are necessary to discern what is true from what is only apparent. It is thus that he often believed himself to have seen what did not exist, and that he persisted in his error. Amongst his paradoxes may be mentioned the opinion he supported, that the coat of the intestines, which the anatomists of his time called *tunica villosa*, is muscular. He also maintained that pulsation belonged to the veins, and not to the arteries. The Czar Peter the Great was an admirer of Leuwenhoeck. This prince, passing by Delft in 1698, sent two of his attendants to request Leuwenhoeck to pay him a visit, and to bring some of his "admirable" microscopes; adding, that he would have gone to visit him at his residence, had it not been that he wished to escape the notice of the multitude. The naturalist, after having showed his instruments to the emperor, exhibited to him the curious phenomenon of the circulation of blood in the tail of an eel. Leuwenhoeck communicated to the Royal Society of London all his Memoirs, which are inserted in the *Philosophical Transactions*. They have also been printed (for the most part separately) in Dutch, at Delft and at Leyden. But a foreign hand has translated into Latin all the compositions of this celebrated naturalist, under the title of *Arcana Naturæ detecta*, Delft, 1695–1699, in four vols. 4to; reprinted at Leyden in 1719, and with the author's correspondence in 1722.

LEUZE, a city of the Netherlands, in the province of Hennegau, and arrondissement of Tournay. It is situated on the river Dender, about six miles from its source, contains 4500 inhabitants, and has a considerable trade in linen. Long. 3. 33. E. Lat. 50. 34. N.

LEVANSO, an island in the Mediterranean Sea, near the western extremity of Sicily, four miles from Favignana. It is the Phorbantia of antiquity. It is nearly six miles in circumference, lofty, rugged, and, excepting at two or three places, inaccessible. It is inhabited, and furnishes corn, wine, oil, and cotton, and faggots and fire-wood, to the cities of Marsala and Trapani. Long. 12. 20. 29. E. Lat. 38. 1. 36. N.

LEVANT, in *Geography*, signifies any country situated to the eastward of us, or in the eastern part of any continent or country, or in that quarter where the sun rises.

LEVANT is also a name given to the eastern part of the Mediterranean Sea, bounded by Anatolia or Asia Minor on the north, by Syria and Palestine on the east, by Egypt and Barca on the south, and by the island of Candia and the rest of the Mediterranean on the west.

LEVEL, an instrument which enables us to find a line or surface exactly level; that is, such as shall be everywhere parallel to the true horizon, or at right angles to the plumb-line or direction of gravity. It also enables us to find the difference between the heights of two or more places on the surface of the earth.

Amongst the great variety of instruments which have been invented for these purposes, and which are all guided by the agency of gravitation, the following are the most important and useful.

Plumb-level.

Levels in which the plummet or plumb-line forms the most essential part have been constructed in many different forms, and under as many names, to suit the purpose or fancies of the various artificers who employ them; such as masons, bricklayers, paviors, carpenters, and others. But the general principle of the construction is to attach a thread and plummet to the upper part of a board or flat frame of wood or metal, in such a manner that, when the thread of this plummet, hanging freely, coincides with a fiducial line marked on the frame, it is at right angles to the base of the instrument; so that when this occurs, the thing to which the base is applied must obviously be level; but if the thread declines from the mark, the thing is lower on one side than the other. In some of these levels, the fiducial line or mark is at the middle of the base, in others at or near the end. But though it is easy to see, that the longer the base, and the farther down the thread the fiducial line extends, so much the more accurate or sensible is the instrument likely to be; yet little or no regard is generally had to this in practice. The vibrations of the lead, which are troublesome in nice operations, may be in a great measure prevented by having it immersed in a vessel with water or other liquor. Sometimes the plummet is enclosed in a glass cover to protect it from the agitation of the wind, and sights or even a telescope are occasionally applied. For a telescope may be added to any kind of level, by applying it upon or parallel to the base of the instrument when there is occasion to take the level of remote objects. One of the simplest forms of a plumb-level is shown in fig. 1, Plate CCCXXII.; and the next we shall describe is another.

The *Artillery Foot-Level* is in the form of a carpenter's square, having its two legs or branches of equal lengths; at their juncture is a little hole, whence hangs a thread and plummet playing on a quadrant, which is divided into twice forty-five degrees from the middle, as shown in fig. 2.

By placing the feet or ends of its two branches on a plane, in such a manner that the thread may play perpendicularly over the middle division of the quadrant, the plane is assuredly level. To use it in gunnery, place the two ends on the piece of artillery, which may be raised to any proposed height, as indicated by the plummet, whose thread will give the degree above the level.

Gunners' Level, for levelling cannons and mortars, consists of a triangular brass plate about four inches high (fig. 3), at the bottom of which is a portion of a circle, divided only into forty-five degrees, as this number is sufficient for the highest elevation of cannons and mortars, and for giving shot the greatest range. On the centre of a segment of a circle turns a piece of brass A B, which may be fixed by a screw at pleasure. Its lower end B serves for a plummet and index, to show the different degrees of elevation of pieces of artillery. This instrument has also a brass foot, not shown in the figure, to set upon cannons or mortars; so that when those pieces are horizontal, the instrument is perpendicular. The foot is to be placed on the piece to be elevated, in such a manner that the point of the plummet may fall on the proper degree; this they call *levelling the piece.*

The *Balance-Level* is wholly suspended as a pendulum. It is furnished with sights, which, when the instrument hangs at rest, show the line of level, and sometimes even a telescope is applied to it. Levels of this sort have been made in various forms. They have but little sensibility, and are liable to be sadly disturbed by the wind.

Desagulier's level, described at considerable length in almost every treatise on this subject, is essentially the same with the method of measuring heights by the barometer, to which, as a mode of levelling, we therefore beg to refer.

Reflecting Level, that made by means of a pretty long surface of water representing the same object inverted which we see erect by the eye; so that the point where these two objects appear to meet, is on a level with the place where the surface of the water is found.

There is another reflecting level, consisting of a mirror of steel, or the like, well polished, and placed a little before the object-glass of a telescope, suspended perpendicularly. This mirror must make an angle of 45° with the telescope, in which case the perpendicular line of the telescope is converted into a horizontal line, which is the same with the line of level.

Water-Level, that which shows the horizontal line by means of a surface of water or other liquor, founded on this principle, that a liquid always places itself level.

The most simple water-level is made of a long wooden trough or canal, whose sides are parallel to the base; so that, being equally filled with water, its surface shows the line of level. This is the chorobates of the ancients, described by Vitruvius.

It is also made with two cups fitted to the two ends of a pipe three or four feet long, about an inch in diameter, by means of which the water communicates from the one cup to the other; and this pipe being moveable on its stand by means of a ball and socket, when the two cups become equally full of water, their two surfaces mark the line of level.

This instrument, instead of cups, may also be made with two short cylinders of glass three or four inches long, fastened to each extreme of the pipe with wax or mastic. Into the pipe is poured some common or coloured water, which shows itself through the cylinders, by means of which the line of level is determined; the height of the water being the same in both cylinders, whether these are themselves perfectly level or not. This level, though very simple, is yet very commodious for levelling at small distances. Various instruments constructed on this principle with water, mercury, and other liquids, have aimed at great perfection; but, as refined levels, we consider them so inferior to the spirit-level, shortly to be noticed, as not to merit a particular description here.

Air-level.

Air-Level, that which shows the line of level by means of a bubble of air enclosed with some liquor in a glass tube which is slightly convex upward, and has its two ends hermetically sealed. When the bubble fixes itself at a certain mark in the middle of the tube, the plane or ruler whereon it is fixed is level. When it is not level, the bubble will rise to one end. This glass tube may be set in another of brass, or in a piece of wood, having an aperture in the middle, through which the bubble of air may be observed. The liquor with which the tube is filled is most commonly alcohol or spirit of wine. This application of a bubble of air is said to be the invention of Dr Hooke; but some ascribe it to Thevenot.

One of these instruments made with sights, is an improvement upon that last described, and, by a little additional apparatus, becomes more commodious and exact. It consists of an air-level AB (fig. 4), about eight inches long, and seven or eight lines in diameter, set in a brass tube 2, with an aperture in the middle C. The tubes are supported by a straight ruler a foot long, at whose end are fixed two sights, 3, 3, exactly perpendicular to the tubes, and of an equal height, having a square hole, subdivided by a cross of thin brass, in the middle of which is drilled a very small hole, through which a point on a level with the instrument is observed. The brass tube is fastened on the ruler by means of two screws, one of which, marked 4, serves to raise or depress the tube at pleasure, for bringing it towards a level. The top of the ball and socket is riveted to a little ruler that springs, one end whereof is fastened with a screw to the great ruler, and at the other end has a screw, 5, serving to raise and depress the instrument when nearly level.

We should consider wires greatly preferable to sights with holes, which, though very small, will take in too great a space to determine the point of level precisely. But the principle of the air-level is brought to an incomparably greater degree of perfection in the instrument next to be described.

Spirit-level.

Spirit-Level. The most accurate levelling instrument in use, and that possessed of the greatest essential advantages, is the spirit-level, which was first constructed by Mr Sisson, and to which various additions and improvements have been since made, particularly by Mr Ramsden. The following is a description of one of the best of these levels. Fig. 5 represents the instrument mounted on its staves, PQR. The telescope, AB, is made from fifteen inches to two feet in length, as may be required. It is achromatic, of the best kind, and shows the objects erect. By turning the screw *a* at the side of the telescope, the object-glass is moved; and thus the telescope is exactly adapted to the eye. In the focus of the eye-glasses are exceedingly fine cross wires, the intersection of which should be so perfectly in the axis of the tube, that by turning it round on its two supporters D, E, and looking through the telescope, the intersection of the wires may constantly cut the same part of the object viewed. They are easily adjusted to this state by means of the four screws *bbbb* placed on the telescope, near the end for the eye. These screws act in directions perpendicular to one another, so that, by unscrewing one and tightening the opposite one, the wire perpendicular to them may be moved either way at pleasure; and in this manner the other wire may be moved, and thus the intersection of the wires is brought exactly into the axis of the tube.

To the telescope is fixed, by two small screws, the level tube *cd*, containing the spirits, with a small bubble of air: this bubble, when the instrument is well adjusted, will settle exactly in the same place, in or near the middle of its tube, whether the telescope be reversed or not on the supporters, which in this case are kept unmoved. To render the level truly parallel to the telescope, the screw at *c* adjusts it vertically, and that at *d* horizontally. The two supporters D, E, on which the level rests and turns, are shaped like the letter Y. The telescope rests within the upper part of them; and the inner sides of each of these Y's are tangents to the cylindric tube of the telescope, which is turned to a true cylinder, and each side touches it only at one place. The telescope can be confined in the Y's by means of two jointed arches or rims, *ff*, which fasten with pins, *gg*, as shown in the figure.

The lower ends of these supporters are inserted into a strong brass bar F G, so as to stand perpendicularly on it. To one of these is applied a fine threaded screw, H, to adjust the tube, when on its supporters, to a true level; and to the same supporter D is sometimes applied a line of tangents as far as ten degrees, in order to take an angle of depression or elevation to that extent. Between the supporters is also sometimes fixed a compass-box I, divided into 360°, and again into four times 90°, having a centre pin and needle, and trigger to throw off the needle from the centre when not used; so as to constitute a perfect circumferentor, connected with all the foregoing improvements. This plate is fixed on a conical brass ferrule, which is adapted to the axis or bell-metal frustum of a cone at top of the brass head of the staves, having a ball and socket, with three bell-metal joints, two strong brass plates LL, four screws *eeee*, for adjusting the conical axis of the stand to be truly vertical, a regulating screw M to the motion on this axis, and a fastening screw N to tighten it on the cone when necessary. The fastening screw N, and the regulating screw M, by which the whole instrument is moved steadily round the vertical axis through a small space, were an addition of Mr Ramsden's. It is to be observed that, since the lower of the two plates LL generally partakes of the inclination of the ground, while the upper should always be level, they are almost never parallel, though usually called "the parallel plates."

Manner of adjusting the level at one station.

The whole level being now placed steadily on its staves, we must gradually adjust the axis of the stand to be truly vertical, if it is not so already. For this purpose the telescope must be placed in a line with two of the screws *e e*, and then levelled by these, if necessary, till the bubble of air in the spirit-tube keeps its position in the middle. It is next to be turned into a line with the other two screws *e e* at right angles to the former, and to be also levelled in that position.

The horizontal motion on the vertical axis being thus far adjusted, the rims *ff* of the Y's are to be opened, the telescope is to be taken off and laid the contrary way upon these supporters. If the bubble of air then rests exactly the same as before, the level and telescope are already adjusted rightly to one another; but if the bubble does not remain the same, the end to which it goes must be noticed, and its position altered; correcting the error partly by the screws *c*, *d*, and H, and partly by repeating the adjustments above described, upon the screws *eeee*.

The intersection of the wires being now directed to any distant object, it may be one of the vanes of the staves or poles hereafter described. (See LEVELLING *Staves.*) If they continue to be against it precisely, while the telescope is turned round its axis on its Y's, it proves, as before mentioned, that the axis coincides with the intersection of the wires. In this easy mode of adjustment consists the excellence of the instrument; for it is hereby capable of being adjusted by only one station and one object, which will at the same time determine it to be in a true level. If, by change of weather, accident, or other cause, the instrument should have lost its level or adjustment, it may thus be readily restored and re-adjusted at the first station; which is an advantage many levelling instruments do not possess.

Since it is often of great importance to execute levelling with accuracy, and the best instrument when out of its adjustment being of little use, it is quite necessary that every person using such an instrument should have it readily in his power to correct it; and the above, which is Ramsden's construction, is well adapted for this purpose. There are no doubt simpler instruments, as, for instance, some of Troughton's; but none of these simple ones admit of anything like such perfect adjustments as the one just described, though they may suit fully as well in the hands of a person not capable of making the adjustments, and of course not capable of taking a nice level at all.

Theory the spir level.

It is well known, that when a plummet or pendulum vibrates freely in a circular arc, the tendency of gravity to bring it to the resting position is everywhere as the sine of the angular distance from that position. Now, if the bubble in the spirit-level moves in a circle, it is obviously acted on by a force precisely similar to that which gravity exerts upon the plummet; and therefore it would seem that a spirit-level should measure small angles with the same accuracy as a sector whose radius is equal to that of the curvature of the glass tube, or a plumb-line of the same length; but there are some causes which diminish its accuracy. When the bubble of air has been brought to the middle of the glass tube, and when the tube, after being deranged, is restored to the very same position, we cannot be sure that the bubble of air will return to the very middle of the tube. This irregularity is produced by the friction of the included liquid against the sides of the tube, and depends on the magnitude of the bubble and the quantity of liquid. In a good level, where the bubble moves about five lines for a minute of inclination, this uncertainty does not exceed half a line, which may be ascertained by pointing the telescope to any object. The coincidence of a plumb-line with a particular mark will, on account of the insensible oscillation of the thread, leave about double the uncertainty which is left by the index of a sector, and which may be estimated at about a hundredth of a line. A variety of interesting researches on this subject by Mr Nixon will be found in the *Philosophical Magazine* for April and May 1827, March 1829, and June 1831.

Constr tion of rit-leve

Levels are commonly made of glass tubes in the state they are obtained at the glass-house. Of these, the straightest and most regular are selected and examined, by filling them nearly with spirit of wine, and ascertaining by trial that side at which the bubble moves most regularly, by equal inclinations of the instrument upon a stage called the bubble trier, which is provided with a micrometer screw for that purpose. The most regular side is chosen for the upper part of the instrument, the others being of little consequence to its perfection. Spirit of wine is used, because if pure it does not freeze at natural temperatures, and is more fluid than water. Sometimes, indeed, though very rarely, ether is employed. The tube and the bubble must be of considerable length. The longer the bubble, the more sensible it is to a small inclination. A very small bubble is scarcely sensible, appears as if attached to the glass, and moves but slowly.

In the use of a level of this kind constructed by Langlois, it was remarked, that when it was properly set in the cool of the morning, it was no longer so in the middle of the day, or when the weather became hot; and that when it was again rectified for the middle of the day, it became false in the evening, after the heat had diminished. The bubble was much longer in cold than in hot weather, and when longer it was too much so, and could not be kept in the middle of the tube, but stood a little on the one or the other side, though the inclination was precisely the same. These defects were small, and such as claim the notice of careful observers only; but they appeared of too much consequence not to produce a wish to remedy them. It was observed that they arose from inequalities in the interior surface of the tube; and by examining a great number of tubes, selected for levels of the same kind, there was reason to conclude that all these levels would have more or less of the same defects, because there was not one tube of a regular figure within. They were at best no otherwise cylindrical than plates of glass can be said to be plane before they are ground. The irregularities were easily discernible.

It was therefore concluded that it would be advisable to grind the inner surfaces of the tubes, and give them a regular cylindrical or rather spindle form, of which the two opposite sides should correspond with portions of circles of very long radius. To accomplish this, a rod of iron was taken of twice the length of the glass tube, and on the middle of this rod was fixed a stout tube of brass of the same length as the tube of glass, and nearly filling the bore. The rod was fixed between the centres of a lathe, and the glass gently rubbed on the brass cylinder, with fine emery and water, causing it to move through its whole length. The glass was held by the middle, that it might be equally ground, and was from time to time shifted on its axis, as was also the brass cylinder, in order that the wear might be everywhere alike. The operation had scarcely commenced before the tube broke; and several others experienced the same misfortune, though they had been well annealed. It was supposed that the emery which became fixed in the brass might contribute to split the glass, each grain continuing its impression with the same point, in a straight line, and in some instances might be disposed to cut the glass as diamond. Yet it is curious that some artists find a wooden cylinder to suit pretty well, probably because it does not hold the emery so firmly as brass does. But when a cylinder of glass was substituted instead of the brass, the emery, rolling on the surface of the glass instead of fixing itself, had better success; so that the tube and cylinder touched each other through their whole length. The same operation was continued, using finer and finer emery to smooth the tube, and prepare it for polishing; after which the tube and cylinder having been well washed, thin paper was pasted round the cylinder, and very equally covered with a small quantity of Venice tripoli. The tube was then replaced and rubbed as before, till it had acquired a polish.

A level thus ground may be either of the proper sensibility, or be too much or too little sensible. It will be too sluggish, if, before grinding, exclusive of the inequalities of the tube, its diameter in the middle of the length should much exceed the diameter of the extremities; or it will be too sensible if this diameter should not sufficiently exceed the other; or, lastly, if the middle diameter be smaller than that of the extremes, the bubble will be incapable of continuing in the middle, but will, in every case, either run to one or the other end, or be divided into two parts.

To correct these defects, and to give the instrument the required degree of perfection, it is proper to examine its figure before the grinding is entirely finished. For this purpose, after cleaning it well, a sufficient quantity of spirit of wine must be put into it, and secured by a cork at each end. The tube must then be placed on the forks or Y's of a bubble trier, and its sensibility, or the magnitude and regularity of the space run over by the bubble, by equal changes of the micrometer screw, must be ascertained. If the run or spaces passed over be too great, they may be rendered smaller by grinding the tube on a short cylinder; but if they be too short, they may, on the contrary, be enlarged, by grinding on a longer cylinder. It is necessary, therefore, to be provided with a number of these cylinders of the same diameter, but of different lengths, which it is advisable to bring to a first figure, by grinding them in a hollow half cylinder of brass. By means of these it will be easy to regulate the tube of the level to any required degree of sensibility, after which the tube may be very quickly smoothed and polished.

A level thus ground was one foot in length, and so was the cylinder on which it was first worked. When finished it was found to be too sensible. It was therefore worked on another cylinder between nine and ten inches long, which diminished its sensibility so far, that the bubble, which was nine inches and four lines long, at the temperature of 68° Fahrenheit, was carried from the middle of the tube exactly one line for every second of inclination. This sensibility was thought sufficient; but if greater is required, it may be obtained by the process here described. For more on this subject, we again beg to refer to Mr Nixon's papers already cited.

It may be remarked, that a glass tube is very subject to be split by grinding its inner surface; the same tube will not be endangered by grinding its external surface, even with coarse emery; and when once the polish of the inside is ground off, the danger is over, and coarser emery may be used with safety. Thick glass is more subject to this misfortune than thinner. The coarsest emery used in grinding the tube here spoken of was sufficiently fine to employ one minute in descending three inches in water.

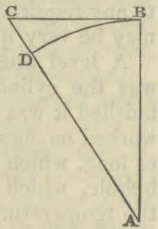
LEVELLING may be defined the art which enables us to find a line or surface exactly level, as also to find how much higher or lower any given point on the surface of the earth is than another.

The practice of levelling, therefore, consists, 1. in finding and marking two or more points that shall be on a level, as already defined; 2. in comparing the points thus found with other points, to ascertain the difference in their heights or levels, for the purpose of making roads, conducting water, draining low grounds, rendering rivers navigable, forming canals, and the like.

With regard to the theory of levelling, we must observe, that a plumb-line, hanging freely in the air, marks the direction of gravity, and a line drawn at right angles to the direction of the plumb-line, and touching the earth's surface, is a true level only on that particular spot; but if this line which crosses the plumb be continued for any considerable length, it will rise above the earth's surface, and the apparent level will be above the true one, because the earth is globular; and this rising will be as the square of the distance to which the said right line is produced; that is to say, it is raised eight inches very nearly above the earth's surface at one mile's distance; four times as much, or thirty-two inches, at the distance of two miles; nine times, or seventy-two inches, at the distance of three, &c. This is owing to the globular figure of the earth; and this rising is the difference betwixt the true and apparent levels; the curve of the earth being the true level, and the tangent to it the apparent level. Hence it appears, that the less distance we take betwixt any two stations, the truer will be our operations in levelling; and so soon does the difference between the true and apparent levels become perceptible, that it is necessary to make an allowance for it if the distance betwixt the two stations exceeds two chains.

Difference between the apparent and true level.

Let BD be a small portion of the earth's circumference, whose centre of curvature is A, and consequently all the points of this arch will be on a level. But a tangent BC meeting the vertical line AD in C, will be the apparent level at the point B; and therefore DC is the difference between the apparent and true level at the point B. The distance CD, therefore, must be deducted from the observed height, to have the true difference of level, or the difference between the distances of two points from the surface of the earth, or from the centre of curvature A. But we shall afterwards see how this correction may be avoided altogether in certain cases.



To find an expression for CD, we have (Euclid, iii. 36) $BC^2 = CD\,(2\,AD + CD)$. But since in all cases of levelling CD is exceedingly small compared with 2 AD, we may safely neglect CD^2, and then $BC^2 = 2\,AD \times CD$, or $CD = \frac{BC^2}{2\,AD}$. Hence the depression of the true level is equal to the square of the distance divided by twice the radius of the curvature of the earth. If we take the mean radius of the earth as the mean radius of its curvature, and consequently 2 AD = 7912 miles, then 5280 feet being one mile, we shall have CD the depression in inches $= \frac{5280 \times 12 \times BC^2}{7912} = 8{\cdot}008\ BC^2$. But when BC is in yards, the value of CD in inches becomes $\cdot 000002585\ BC^2$. From these data was computed the following

Table showing the Difference between the True and Apparent Levels, so far as depends on the Curvature of the Earth.

Distance.	Depression.	Distance.	Depression.	
Yards.	Inches.	Miles.	Feet.	Inches.
100	·026	·25		0·50
200	·103	·50		2·00
300	·233	·75		4·50
400	·414	1·		8·01
500	·646	2·	2	8·03
600	·931	3·	6	0·07
700	1·267	4·	10	8·13
800	1·654	5·	16	8·20
900	2·094	6·	24	0·29
1000	2·585	7·	32	8·39
1100	3·128	8·	42	8·51
1200	3·722	9·	54	0·65
1300	4·369	10·	66	8·80
1400	5·067	11·	80	8·97
1500	5·816	12·	96	1·15
1600	6·618	13·	112	9·35
1700	7·471	14·	130	9·57
1800	8·376	15·	150	1·80

A table sufficiently large to embrace every case, by simply taking proportional parts between its numbers, would occupy several pages; but the formula is of general application. However, when the distance is in miles, eight times its square will be very nearly the depression in inches, or two thirds of the same square the depression in feet. When the distance is in chains, a convenient rule for many ordinary purposes is to divide its square by 800; the quotient is very nearly the depression in inches. In this manner was computed the following table of the curvature of the earth:—

Distance.	Depression.	Distance.	Depression.
Chains.	Inches.	Chains.	Inches.
1	0·00125	27	0·91
2	0·00500	28	0·98
3	0·01125	29	1·05
4	0·020	30	1·12
5	0·031	31	1·20
6	0·045	32	1·27
7	0·061	33	1·35
8	0·080	34	1·44
9	0·101	35	1·53
10	0·125	36	1·62
11	0·150	37	1·71
12	0·180	38	1·80
13	0·211	39	1·90
14	0·24	40	2·00
15	0·28	45	2·53
16	0·32	50	3·12
17	0·36	55	3·78
18	0·40	60	4·50
19	0·45	65	5·28
20	0·50	70	6·12
21	0·55	75	7·03
22	0·60	80	8·00
23	0·66	85	9·03
24	0·72	90	10·12
25	0·78	95	11·28
26	0·84	100	12·50

The preceding formulæ and tables suppose the visual ray CB to be a straight line; whereas, on account of the unequal densities of the air at different distances from the earth, the rays of light are incurvated by refraction. The effect of this is to lessen the difference between the true and apparent levels, but in such an extremely variable and uncertain manner, that if any constant or fixed allowance is made for it in formulæ or tables, it will often lead to a greater error than what it was intended to obviate. For, though the refraction may at a mean compensate for about a seventh of the curvature of the earth, it sometimes exceeds a fifth, and at other times does not amount to a fifteenth. We have therefore made no allowance for refraction in these tables or formulæ; but we shall presently see how its effects may frequently be obviated.

Levelling is either simple or compound. The former is when the level points are determined from one station, whether the level be fixed at one of the points or between them. Compound levelling is nothing more than a repetition of many simple operations.

Simple levelling.

An example of simple levelling is given Plate CCCXXII. fig. 7, where A, B are the station-points of the level; C, D the two points ascertained. Let the height from A to C be six feet, and from B to D nine feet, the difference is three feet which B is lower than A.

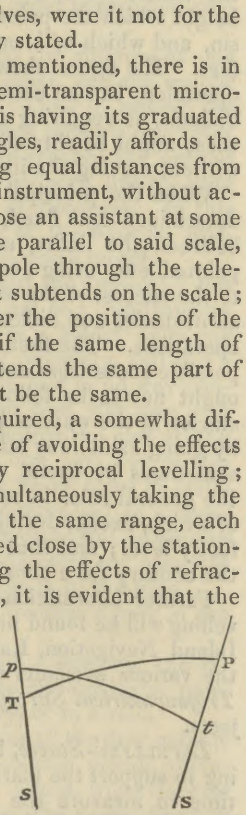
Had the station-points of the level been above the line of sight, and the distance from A to C been six feet, and from B to D nine feet, the difference would still have been three feet which B was higher than A.

But when the distance between the stations is considerable, we must provide for the effects of the curvature of the earth and of the refraction of the atmosphere. As to the former, it may be readily ascertained by the tables and formulæ given above, provided we know the distance; and we shall presently show how it may be frequently compensated for, or avoided altogether. But the refraction is so extremely variable, that it cannot be disposed of with the like certainty, though there are several ways in which its effects may often be avoided or compensated in a great measure along with those of curvature, as we shall now explain. If the levelling instrument, instead of being placed at the one station and directed to the other, were set either in the middle between or at equal distances from both stations, such instrument, properly adjusted, being directed first to the one station and then to the other, would, by means of the intersection of the wires, mark upon the poles at these stations two points, which would either be exactly on a level, or would differ only in a small degree, owing to some slight inequality in the refractions. For if, on account of the joint effects of curvature and refraction, the point observed on the one pole were, for example, six feet above the level of the instrument itself, the same must obviously hold of the point observed on the other pole, so far at least as the curvature of the earth is concerned; and unless the refraction be different on the different sides of the instrument (which may sometimes happen in a small degree), the points marked on the two poles must be on a level. In this way, it is obvious, that were it not for the figure of the earth being slightly spheroidal, the effect of curvature would be entirely avoided, and that of refraction very nearly.

Sometimes, in place of using two poles and one levelling instrument, two of the latter are employed simultaneously at equal distances from the same pole. In that case the difference in the heights of the points which they mark upon it should be equal to the difference in the heights of the instruments themselves, were it not for the source of slight inaccuracy already stated.

To facilitate the operations just mentioned, there is in the telescopes of some levels a semi-transparent micrometer scale instead of wires. This having its graduated edge crossing the axis at right angles, readily affords the means of approximately estimating equal distances from the stations or from the levelling instrument, without actual measurement. For this purpose an assistant at some distance holds up a pole so as to be parallel to said scale, while the observer, viewing the pole through the telescope, notices how many divisions it subtends on the scale; and, of course, in whatever manner the positions of the assistant or telescope are varied, if the same length of pole held parallel to the scale subtends the same part of it, the distance between them must be the same.

But where great accuracy is required, a somewhat different and greatly preferable mode of avoiding the effects of curvature and refraction is by reciprocal levelling; which consists in two observers simultaneously taking the levels from the opposite ends of the same range, each having a levelling instrument placed close by the station-pole of the other. Thus, supposing the effects of refraction to be alike in both directions, it is evident that the difference in the heights of telescopes placed horizontally at T and *t* must equal the difference in the heights of the points P and *p*, to which these telescopes are respectively directed on the opposite station-poles PS and *ps*; so that *p* is as much below the level of P as *t* is lower than T, and therefore P*t*—*p*T is double the difference in the levels of T and *t*, or of P and *p*. A great recommendation to this method is, that it does not require the distance between T and *t* to be known. But it readily affords the means of ascertaining the effect of refraction separately when the distance is known, because that is equal to the excess of the effect of the earth's curvature over the difference in the levels of T and P.



When the levelling instruments in the reciprocal method admit of their telescopes being elevated or depressed from a state of parallelism with the spirit-levels, and are likewise provided with the means of measuring such deviation; then, if each telescope be directed exactly to the other, the two angles which the axes of the telescopes make with the respective vertical lines, together with the horizontal angle (or that which these verticals form with each other), must obviously exceed 180° by the sum of the refractions in both directions. This, however, is more properly applicable to the mensuration of great differences of level by a trigonometrical process than to ordinary levelling. But neither this nor any other method yet known gives the exact values of the two refractions separately. It only gives their sum, still leaving some little uncertainty as to the separate or proper value of each refraction.

Compound levelling.

As an example of compound levelling, suppose it were required to know the difference of height between the points A and N, fig. 8. In this operation stakes or pegs should be driven down at A and N, nearly level with the surface; and should be so fixed, that they may not be changed until the whole operation is finished. A plan of the ground between the proposed points A and N should then be made, by which will be discovered the shortest way between them, and whence, too, the number of stations necessary to be taken will be determined. The operator will also be able to distribute them properly according to the nature and situation of the ground. In the figure twelve stations are marked. Stakes or pegs ought to be driven in at the limits of each station, as A, B, C, D, &c. They ought to be two or three inches above the ground, and driven firmly into it; but where rock occurs, it may be sufficient to make a mark on it. Stakes should also be driven in at each station of the instrument, as 1, 2, 3, 4, &c.

The operation may be begun in the following manner. Let the first station be at 1, equally distant from the two points A and B, which themselves are distant 166 yards. Write down then in one column the first limit A, with the number of feet, inches, and tenths, which the point of sight indicated on the station-staff at A, viz. seven feet six inches; in the second column, the second limit B, with the height indicated at the station-staff B, viz. six feet; lastly, in the third column, the distance from one station-staff to the other, which in this case is 166 yards. Remove now the level to the point marked 2, which is in the middle between B and C, the two places where the station-staves are to be held; observing that B, which was the second limit in the former operation, is the first in this. Then write down the observed heights as before; in the first column B with four feet six inches; in the second, C with five feet six inches $\frac{2}{10}$ths; in the third, 560 yards, the distance between B and C.

Should it be impossible, on account of the inequality of the ground at the third station, to place the instrument in the middle between the two station-staves, find the most convenient point, as at 3; then measure exactly how far this is from each station-staff, as, for instance, from 3 to C 160 yards; from 3 to D 80 yards; and the remainder of the operation will be as in the preceding station.

In the fourth operation, we must endeavour to compensate for any error which might have happened in the last, from the instrument not being in the middle between, or

Levelling.

at equal distances from the stations. Mark out, therefore, 80 yards from the station-staff D to the point 4, and 160 yards from 4 to E; and this must be carefully attended to, as by such compensations the work may be much facilitated. Proceed in the same manner with the eight remaining stations, observing to enter everything in its proper column. If all the ascents are not in one column by themselves, and all the descents in another, regard must be had to the proper signs of these quantities, which is rather more troublesome. And when the whole is finished, sum each column separately, and then subtract the less from the greater; the difference, which in the present case is 5 feet 4 inches $\frac{8}{10}$ths, shows the ground at N to be thus much lower than at A.

To obtain a section of this level, draw the dotted line O O, fig. 8, either above or below the plan, which may be taken for the level or horizontal line. Let fall then perpendiculars upon this line from all the station-points and places where the station-staves were fixed. Beginning now at A, set off 7 feet 6 inches upon the vertical line from A to *a;* for the height of the level point determined on the staff at this place, draw a line through *a* parallel to the dotted line OO, which will cut the third perpendicular at *b*, the second station-staff. Set off from this point downwards six feet to B, which shows the second limit of the first operation; and that the ground at B is one foot six inches higher than at A: place your instrument between these two lines at the height of the level line, and trace the ground according to its different heights. Now set off, on the second station-staff B, four feet six inches to C, the height determined by the level at the second station; and from C draw a line parallel to O O, which will cut the fifth perpendicular at *d*, the third station-staff. From this point set off five feet six inches $\frac{7}{10}$ths downwards to C, which will be our second limit with respect to the preceding one, and third with respect to the first. Then draw your instrument in the middle between B and C, and delineate the ground, with its inequalities. Proceed in the same manner from station to station, till you arrive at the last N, and you will have the profile of the ground over which the level was taken.

This method answers very well where only a general profile of the different stations is required; but where, for some special purpose, it is necessary to have an exact detail of the ground between the limits, we must go to work more particularly. Suppose, therefore, the level to have been taken from A to N by another route, but on more uniform ground, in order to form a canal. Draw at pleasure a line to represent the level, and regulate the rest; then let fall on this line perpendiculars to represent the staves at the limits of each station, taking care that they be fixed accurately at their respective distances from each other. The difference between the extreme limits in this case ought to be the same as in the former, viz. five feet four inches $\frac{8}{10}$ths. Set off this measure upon the perpendicular of the first limit; and from it, prolonging the perpendicular, mark off the height determined at the first station-staff. Do the same with the second and third, and so on with the rest, till this part of the work is finished; there remains then only to delineate in detail the ground between the station-staves. Sometimes a series of stakes is fixed in the ground, of such various lengths that all their tops are on a level. This, however, can only be done where the difference of level is small; and is used rather with the view of regulating some works to be executed or erected along the line, than for the mere purpose of levelling.

Fig. 9 gives an example of compound levelling, where the situation is so steep and mountainous, that the staves cannot be placed at equal distances from the instrument, or where it is even impossible to make a reciprocal levelling from one station to the other. Thus, suppose the point K to be the bottom of a basin where it is required to make a fountain, the reservoir being at A; so that, in order to know the height to which the jet d'eau will rise, it is necessary to know how much the point A is above K.

In great heights such as this, it will be necessary to proceed by small descents or ascents, as from A to B, or C. The instrument must be adjusted with all possible care; and it may even be proper, in some part of the work, to use a smaller instrument. The following is a table of the different operations used in making this level.

Ascents.			Descents.			Distances.
	Feet.	Inches.		Feet.	Inches.	Yards.
A	21	6	C	0	9	90
C	4	3	D	0	3	40
D	3	9	E	16	3	350
E	5	0	F	17	9	250
F	10	6	G	5	0	375
G	5	0	H	19	0	300
H	5	0	K	47	3	1000
	55	0		106	3	2405

In this case only two levellings are supposed to be made between A and D, though more were necessary; but they are omitted to avoid confusion. In the fourth station the height found was sixteen feet eight inches; but, on account of the great length, it was requisite to reduce the apparent level to the true one. At the last limit we get the height from *n* to *o;* then from *o* to I; from I to K; all which added together, and then corrected for the curvature, give forty-seven feet three inches. Now, by summing each column separately, and subtracting one from the other, we have fifty-one feet three inches for the height which the point A is above the bottom of the basin, and which will cause the jet d'eau to rise forty-five feet. The figure shows only the general section of this operation, but an exact profile of the mountain is more difficult, as requiring many operations; though some of these might be obtained by measuring from the level line without moving the instrument.

When the principal limits of the levelling have been determined and fixed, it only remains to find the level between the limits, according to the methods already pointed out, using every advantage that may contribute to the success of the work, and at the same time avoiding all obstacles and difficulties that may retard or injure the operations. The first rule is always to take the shortest possible route from one limit to another, though this rule ought not to be followed if there are considerable obstacles in the way, as hills, woods, marshy ground, or if, by going aside, any advantage can be obtained. It may sometimes be useful to deviate very considerably from the general rule, in order to take in ponds, the surfaces of which, except during storms, might all be taken as perfectly level; and thus levels are frequently taken across the country for a considerable way.

Farther information connected with the practice of levelling will be found under the articles relating to Canals, Inland Navigation, Railroads, Surveying, &c.; as also in the various accounts which have been published of the *Trigonometrical Survey*, and in other works on similar subjects.

Levelli
Staves

Levelling-Staves, instruments used in levelling, serving to support the marks to be observed, and at the same time to measure the heights of those marks from the ground. They usually consist of mahogany staves ten feet long, each being in two parts, which slide in upon one another to about $5\frac{5}{10}$ feet, for the more convenient carriage. They are divided into small equal parts, and numbered at every tenth division by 10, 20, 30, &c. as in figure 6; and on one side the feet and inches, or tenths, are also sometimes marked. These staves are likewise frequently called *levelling poles*, *station-poles*, or *station-staves.*

A vane A slides up and down each of these staves, and by brass springs will stand at any part. These vanes are about ten inches long and four inches broad; and are painted with stripes of white and black alternately. They have each a brass wire across a square hole in the centre, which serves to point out the height correctly, by coinciding with the horizontal wire of the telescope of the level.

LEVEN, the name of a river in Dumbartonshire, another in Fifeshire, and of a loch in Kinross-shire.

Leven, a town or large village of Scotland, on the coast of Fife. It consists of two principal streets, with numerous by-lanes and detached mansions. The staple trade of Leven is the weaving of linen goods, which employs a considerable number of workmen. There is also an iron foundery, a brick and tile work, and a pottery for coarse earthenware. The population may be estimated at 1500.

LEVER, in *Mechanics*, is a bar of iron or wood, one part of which being supported by a fulcrum, all other parts turn upon that as their centre of motion. This instrument is of two kinds. First, the common sort, where the weight which we desire to raise resting at one end, our strength is applied at the other, and the fulcrum is between both. When we stir up the fire with a poker, we make use of this lever; the poker is the lever, it rests upon one of the bars of the grate as a fulcrum, the incumbent fire is the weight to be overcome, and the other end held in the hand is the strength or power. In this, as in all the others, we have only to increase the distance between the strength and fulcrum, in order to give him who uses the instrument greater power.

The lever of the second kind has the fulcrum at one end, the strength is applied at the other, and the weight to be raised rests between them. Thus in raising the water-plug in the streets, the workman puts his iron lever through the hole of the plug till he reaches the ground on the other side, and, making that his prop, lifts the plug with his strength at the other end of the lever. In this lever also, the greater the distance of the fulcrum from the strength, the greater is the workman's power.

These instruments, as we see, assist the strength; but sometimes a workman is obliged to act at a disadvantage in raising either a piece of timber or a ladder upon one end. We cannot, with grammatical propriety, call this a *lever*, since such a piece of timber in fact in no way contributes to raise the weight. In this case, the man who is the strength or power is in the middle, the part of the beam already raised is the weight, the part yet at the ground is the fulcrum on which the beam turns or rests. Hence the man's strength will be diminished in proportion to the weight it sustains. The weight will be greater the farther it is from the fulcrum, therefore the man will bear the greater weight the nearer he is to the prop.

LEVERET, amongst sportsmen, denotes a hare in the first year of her age.

LEVIGATION, in *Pharmacy* and *Chemistry*, the reducing hard and ponderous bodies to an impalpable powder, by grinding them on a porphyry, or in a mill.

LEVITE, in a general sense, means all the descendants of Levi, amongst whom were the Jewish priests themselves, who, being descended from Aaron, were likewise of the race of Levi. In a more particular sense, *Levite* is used to signify an order of officers in that church, who were employed in performing the manual service of the temple. They were obedient to the priests in their ministration, and brought them wood, water, and other necessaries for the sacrifice. They sung and played upon instruments in the temple and in other places. They applied themselves to the study of the law, and were the ordinary judges of the country, but always subordinate to the priests. Their subsistence consisted of the tithes of corn, fruit, and cattle, throughout Israel; but the priests were entitled to a tenth of their tithes, by way of first fruits to the Lord. Forty-eight cities were assigned for the residence of the Levites, of which the priests claimed thirteen, six being chosen as cities of refuge. They were consecrated, before they entered upon their ministry, by shaving their flesh, washing their clothes, and sprinkling with the water of expiation. Imposition of hands was used in consecration, and two bullocks were offered at the door of the tabernacle. They waited weekly, and by turns, in the temple, beginning their attendance on one sabbath and ending the next, during which time they were maintained out of the offerings. In the time of Solomon, the number of Levites, from the age of twenty, and capable of serving, was thirty thousand.

LEVITICUS, a canonical book of the Old Testament, so called from its containing the laws and regulations relative to the priests, Levites, and sacrifices.

LEVROUX, a town of France, in the department of the Indre, and the arrondissement of Chateauroux. It stands on the river Nahon, and contains 330 houses, with 2900 inhabitants.

LEWES, a borough-town of the rape of Swanbrough, in the county of Sussex, situated on the right bank of the Ouse, from which it gradually rises, forty-nine miles from London. It stands at the foot of the chalk hills, and is well built and pleasantly situated. It was anciently walled, and still retains the remains of an ancient fortress. It formerly had twelve churches, now reduced to six, and before the reformation several religious houses. It has now several charity schools, and other benevolent institutions. It is not incorporated, but returns, and will continue to do so, two members to the House of Commons. The summer assizes are held here. There is some trade by the river, which is navigable for barges to Newhaven. On its banks are some cast-iron founderies. The market is held on Saturday. The population amounted in 1801 to 4909, in 1811 to 5221, in 1821 to 7083, and in 1831 to 8592.

LEWIS, one of the largest of the Hebrides, or Western Islands of Scotland, extending about eighty miles in length from north to south, and from thirteen to fourteen in breadth, consisting of a great number of isles and rocks, and parted by the sea into two divisions, called Lewis and Harris, the former lying to the westward of the latter. Lewis belongs to the county of Ross, is divided by several channels, distinguished by several names, and portioned out amongst different proprietors; but the Lewis, strictly so called, stretches out about thirty-six miles in length, from the northern point of Bowling Head to the southern extremity of Hussiness in Harris. The air is temperately cold, moist, and healthy; a great part of the low ground is flooded with lakes, and the rest is in some parts arable. Lewis is not so mountainous a region as Harris, but it is of as desert a character. Except along the margin of the sea, and in the immediate neighbourhood of Stornoway, the country is everywhere open, bare, brown, and uninteresting. The shores, particularly near the middle of the island, are deeply indented with arms of the sea, in which herrings and white fish are plentiful. A variety of streams, which issue often from small inland lakes, abound with trout and salmon. The grazing of cattle constitutes the chief means of support of the inhabitants. Lewis is divided into four parishes, viz. Barvas, Lochs, Stornoway, and Uig. There are a few scattered hamlets, but only one

Lewis.

town, Stornoway, which lies on the east side of the island, at the head of a bay or harbour, to which it gives its name. It is a place of considerable size, and there are in it schoolmasters and missionaries for the instruction of the inhabitants. It is a singular fact, that the latter are of unmixed Danish origin, which is the case in none of the other islands. The population amounts to about 12,000.

Lewis is the name of an instrument which is indented into a large stone, and has a ring for the purpose of making fast a rope, in order to move the stone, or to act as a stay. It is called in Italian *ulivella*, in French *la louve*, in German *stein zange*. The lewis consists of three wedges of iron, forming, when put together, a dove-tail. The wedges are inserted into an equal and similar hollow dove-tail excavated in the stone. This hollow dove-tail is made exactly of the form and size of the lewis, and is a figure of six sides; a pair of vertical sides, which are opposite, equal, and parallel, and in form of truncated isosceles triangles; a pair of inclined sides, opposite equal rectangles, equally inclined to the axis of the hole, and not parallel. The top and base of the hole are rectangles parallel to each other, the base being longer than the top. The centre of the base and the centre of the top are in one vertical line. The form of the hole therefore is that of an inverted wedge with the point cut off; it is like a cavity fitted to contain the inverted keystone of an arch. When the iron dove-tail called the lewis is inserted into this hollow dove-tail made in the stone, the ring at the smaller and upper end of the iron dove-tail serves for making fast a rope, for the purpose of raising the stone. The constitution of the substance of timber enables the workman to fix a rope to it by merely inserting a screw or a spike into the log; stone will not admit of these, and is made fast by the contrivance of the lewis. The lewis of the most useful form, and that which is used in Britain, is represented at fig. A, Plate CCCXXI.; *a* and *b* are two pieces of iron, in form of inverted wedges. These pieces are inserted into a quadrangular hole which is made in the stone. The two opposite and shortest sides of the hole are dove-tailed, or, in other words, under-cut, as represented at fig. B, which is a vertical section of the hole; *t* is the plan of the hole at top, *o* is the plan of the bottom of the hole. The hole, as represented in the figure, is five inches long at top, and six inches at bottom; the width is one inch; the depth seven inches. Sometimes the width is one and a half inch, and the depth four or five inches. The hole is made of such a size that the lewis fits exactly into it; *a′*, *c′*, *b′*, are transverse geometrical views of the pieces *a*, *c*, *b*; in the transverse views it is seen that the transverse sections of the parts of these pieces that enter the stone are of the same breadth from top to bottom. The piece *c* is represented with a perforation at top, for the purpose of taking out this piece more easily when the lewis is to be unshipped, but the lewis is usually made without this upper perforation. The pieces *a*, *b*, are first introduced into the hole, then is driven in *c*, which may either be a parallelopiped, or it may be a little thicker above, in form of a wedge; the ring *m* is then put on, and the bolt *g h* is passed through the holes of the ring and of the three pieces; the bolt enters at *g*, and forelocks at *h*. The tackle by which the stone is to be elevated is hooked on the ring *m*. This ring, in cases where a rope is to be passed through it, is bound round with cord, to prevent the rope from being chafed by the iron of the ring.

Piranesi has proposed and figured some other forms of this machine in his *Antichità di Roma*, but they do not appear to be so convenient as the lewis of the common form above described: one of the forms of lewis given by Piranesi is represented at fig. F. The two pieces which constitute the iron dove-tail open and shut by a joint; *n* is a bolt, which is put into the round hole at *p* after the instrument is inserted into the stone; this transverse bolt serves to keep the legs of the instrument spread out, so as to retain the form of the dove-tail. The lewis of the most usual form, represented at fig. A, and a lewis of another form, fig. G, are figured and described in Perrault's *Vitruvius*, lib. x. chap. 2, and in the *Theatrum Machinarum*, tab. xxxv. p. 111. In the lewis, fig. G, the iron dove-tail L has a ring at top, *r*, for receiving a rope; L is put into the dove-tailed hole in the stone, and then the two parallelopipedal iron bolts *e*, *u*, are put in on each side of the iron dove-tail; *e* and *u* are of equal thickness throughout. The top of the hole must not be less than the bottom of the piece L, to the end that L may enter into the hole. The ring must not project beyond the lines which form the prolongation of the inclined sides of the wedge L; for if the ring projected, the pieces *e*, *u*, could not be put into the hole. The hole must be formed so that the machine may fit accurately into it.

The lewis is used for raising large stones of several tons weight, in the building of harbours, bridges, and other solid fabrics, which, from the forces by which they are assailed, or on account of the long period they are designed to endure, require to be constructed of great masses of stone. Leupold, in his *Theatrum Machinarum*, mentions, that in many churches in Holland the pavement consists of large slabs of stone or marble, each of them the size of a grave, and covering a burying-place; these slabs are laid close to one another, and join accurately, so that no lever or crow can be introduced into the joint to raise them; in each of the slabs there is a hole cut in form of a hollow dove-tail, and into this hole a lewis is introduced when occasion requires that the tomb should be opened.

In the construction of harbours, the lewis fixed in a large stone frequently serves to make fast the ropes which stay the cranes. The lewis is commonly used in the docks at London for fixing mooring-rings in the stone: the ring is easily removed when requisite, by unshipping the bolt of the lewis; for this and other reasons it is found more convenient to employ the lewis for fixing rings, than to run the ring-bolt into the stone with melted lead.

The largest stones that have been wrought and moved by the industry of man, occur in the buildings of the ancient Egyptians; but it is not ascertained whether their architects employed the lewis.

Piranesi, in his *Antichità di Roma*, describes and figures lewis-holes existing in the upper surface of the large stones of the tomb of Cæcilia Metella, at Capo di Bove, near Rome. The *forcipes ferrei quorum dentes in saxa forata accommodantur*, mentioned by Vitruvius (lib. x. cap. 2), denote a machine in the form of nippers, used to effect the raising of stones in the same way as the lewis; but the words seem to indicate a machine different in form from the lewis. Piranesi also observed in some ancient unfinished buildings, stones which appeared to have been raised by another method, namely, by knobs left on the front and side of the stone, to which knobs the ropes were attached. The knobs were taken off when the building was finished.

Vasari relates, in his account of Brunalesco, that the use of the lewis was revived in Italy by that architect, who was well skilled in mechanics, and who constructed the cupola of the cathedral church of Santa Maria del Fiore, at Florence, about the year 1430; the first great cupola that was built in Europe, and which Michel Angelo had in view when he designed the cupola of St Peter's. The lewis called Brunalesco's is represented at fig. C, Plate CCCXXI. Leo Baptista Alberti, a Florentine architect, who lived in 1440, in his treatise *de Architectura*, mentions the lewis by the Latin name of *impleola*. He describes the side wedges as having the figure of the letter

D, and from that form the machine had its Italian name *ulivella*, that is to say, *little olive*. Philander of Chatillon, in his *Commentary on Vitruvius*, published at Rome in 1544, gives a figure of the lewis used at Rome in his time, which resembles that used in England, and represented at figure A. In the *Archæologiæ* (vol. x.) there is a description of holes observed in the keystones of the Abbey Church of Whitby, which was built about 1370, in the reign of Edward III. as is supposed. These holes appear to have been lewis-holes; they are of the form of an inverted Y, as represented at fig. D, where *w* is the plan of the top of the hole, and *t t* the plan of the bottom; the lewis that fitted into these holes would resemble that represented at fig. E. These keystones at Whitby weigh about one ton and a half.

LEWIS, or *Louis*, the name of several kings of France. See the article FRANCE.

LEWISHAM, a parish in the hundred of Blackheath and county of Kent, six miles from London, situated on a branch of the river Broxbourne. It is chiefly inhabited by the richer class of citizens of the metropolis as their country retreats. The church is an elegant modern structure, rebuilt since it was destroyed by a fire. The population amounted in 1801 to 4007, in 1811 to 6625, in 1821 to 8185, and in 1831 to 9659.

LEXIARCHI, at Athens, six officers, assisted by thirty inferior ones, whose business it was to impose fines upon such as came not to the public assemblies, and also to make scrutinies amongst such as were present. The lexiarchi kept a register of the age, manners, and abilities of the citizens, who were always enrolled at the age of twenty.

LEXICON, the same with dictionary. The word is chiefly used in speaking of Greek dictionaries, and is derived from the Greek λεξις, *word, diction*, from λεγω, *I speak*.

LEXINGTON, a town of Kentucky. See KENTUCKY.

LEYDEN, a circle of Holland, divided into three cantons, viz. Leyden, Noordwyk, and Woubrugge, and containing about 60,000 inhabitants. The city of Leyden, which gives its name to the circle, is situated on both sides of a branch of the river Rhine, which, though diminished by other branches that take their course to the sea before it arrives at this city, still retains its original name. It receives here the water of the smaller streams of the Does, the Bliet, the Mare, and the Zyl, and is, besides, intersected by several canals, thus dividing the city into numerous islands, which are connected together by nearly 100 bridges. The streets are broad, clean, and well paved; and the high street, which runs through the whole city, is perhaps one of the finest in Europe. The walks in and around the city are distinguished by their pleasing neatness. The most striking building is the stadthouse, in which is the fine picture of the last judgment by Lucas. St Peter's church is remarkable for the sarcophagus to the memory of Boerhaave, and monuments to three of the most distinguished citizens who lost their lives by the explosion of a vessel laden with gunpowder in 1807. There are, besides, sixteen other churches, and two fine hospitals, one of the finest of which is that which belonged to the Catholics a few years ago. The university, founded in 1575, has long maintained a high rank amongst the best institutions for education in Europe, and has produced the most distinguished men in every branch of knowledge. It now contains about twenty professors in the four departments of law, theology, medicine, and philosophy, and from 300 to 400 students. Attached to the university is a library, containing 60,000 volumes of books, and 14,000 manuscripts, some of them of the most valuable and curious kinds. It has also an observatory, an anatomical theatre, a botanic garden, a chemical laboratory, and several collections of natural and physical curiosities. The trade and manufactures of Leyden were once very extensive, but have much declined of late years. It has still, however, some considerable manufactures of woollen and linen cloths, and the black and scarlet cloths are much admired for their beautiful and permanent colours. The printing of books, especially of classical books, was once a great branch of industry, though now it is much diminished. Leyden has been the birth-place or residence of some of the most distinguished individuals, especially of Rembrandt and Lucas, painters; of Muschenbroeck and Boerhaave, naturalists; and of Scaliger, Salmasius, Heinsius, and others, critical and classical scholars. In 1816, the population was 28,600, but since that time it has increased, and, by the census of 1830, appears to be 34,564, viz. 16,131 males, and 18,433 females. It is situated in latitude 52. 8. 25. north, and longitude 4. 22. east. The environs of the city are ornamented with many seats of the inhabitants. The soil is rich, but, from its moisture, more appropriate for pasture than for grain. The dairies are numerous, and afford butter excellent for its flavour; and, from being capable of being kept a long time, it, along with cheese, forms an important part of the exportable commodities of Holland.

Leyden.

LEYDEN *Isle*, an island situated off the north-west coast of Ceylon, about thirteen miles in length by two and a half in breadth. It contains excellent pasture for cattle and horses.

LEYDEN, *John*, a celebrated linguist, antiquary, and poet, was born on the 8th of September 1775, at Denholm, a village on the banks of the Teviot, nearly opposite to Minto House, in the parish of Cavers and county of Roxburgh. His father was able to trace back his pedigree through a line of shepherds and husbandmen who had long occupied small farms on the estate of Douglas of Cavers, one of whom, Adam Ledan, in Little Cavers, a stern Presbyterian, had been denounced as a rebel, in a royal proclamation, in 1684. From his second to his sixteenth year, young Leyden lived with his parents in a retired cottage near the bottom of the "stormy Ruberslaw," where he was taught to read by his father's mother, and where he had no companions except the inmates of that rustic dwelling, and no books except the Bible, and such other volumes as are commonly possessed by the Scottish peasantry. His chief delight in the years of childhood was to listen to the tales of martial adventure and supernatural agency, recited by a blind uncle of his mother, and to read such works as the Metrical Histories of Bruce and Wallace, the Poems of Sir David Lindsay, and the *Arabian Nights' Entertainments*. In his tenth year, he went first to school at Kirktown, a distance of two miles from his father's house, and there, under three successive schoolmasters, he learned writing, arithmetic, and the elements of Latin grammar. After having spent three years in this manner, he was placed under the charge of Mr Duncan, a Cameronian minister at Denholm; and at the end of two years, not unprofitably employed in this small seminary, he entered the university of Edinburgh in November 1790. Mr Dalzel, then professor of Greek, has repeatedly stated to the writer of this article, that he had seldom known any young man who at first appeared worse prepared for college, and who so speedily surmounted the disadvantages of imperfect tuition. He had accumulated a great stock of knowledge by a process of study peculiar to himself; but he had not thought it necessary to make himself master of grammatical rules; and, with all his strength and acuteness of mind, he at this time expressed his meaning in terms exceedingly awkward, and in a tone of voice so dissonant and loud as to set his fellow-students in a roar. He attended three winter sessions at the classes for languages and philosophy, applying with extraordinary ardour to every branch of inquiry connected with his academical studies, and to many other pursuits in which none of his instructors could have guided him. The vacations were generally passed in his native wilds amongst his own relations, with the exception of the summer 1792, when he acted as assistant in a village school at Whitebanklee, or Clovenfords, on Cadon Water, a mountain stream which falls into the Tweed below Ashiesteel, on the skirts of Ettrick Forest. The charge of the school was left almost entirely to him; but the management of thirty boys and girls, from six to twelve years of age, appeared to be a task for which he possessed no manner of aptitude. Two of his pupils, who were learning Latin, looked up to him with deference and admiration; one of whom did not long survive him, and the other has held various appointments in the church and the universities; but the children in general were in a state of insubordination and tumult, which he endured with a degree of calmness, of which those who knew him in maturer life would have conceived him to be incapable. At this time his appearance was very prepossessing. He was ruddy and fair, with a frame rather delicate than robust, and an expression of great good-nature and gentleness in his features.

In November 1793, he entered on the study of divinity, church history, and Hebrew, and passed through the usual course of four years' attendance, before he was proposed for trials as a licentiate or probationer of the church of Scotland. Much of his attention was in the mean time devoted to historical research, to philology, to metaphysical speculations, and to natural history and medicine. He was a member of various debating societies, in all of which he distinguished himself by the fluency and copiousness of his unpremeditated harangues, rather than by any graceful or polished eloquence. In one of these institutions, he contracted an intimacy with Mr Henry Brougham, and with the late Dr Thomas Brown and Mr Francis Horner, as well as with several other individuals, who subsequently attained no inconsiderable distinction. About the same time he formed an acquaintance with some literary men farther advanced in life, as Mr Thomson, author of *Whist*, a poem, and Dr Robert Anderson, editor of the British Poets, and then supposed to be connected with the *Edinburgh Magazine*, to which both Leyden and Mr Thomas Campbell, one of his youthful friends, contributed some of their earliest poetical essays.

When he had completed his theological education, he accompanied one or two pupils to St Andrews in 1797, where he eagerly embraced the opportunity of attending the lectures of Dr Hunter, professor of humanity, and of Principal Hill, one of the divinity professors. He became also a member of the Theological Society, in which he delivered a number of discourses, one *On the Argument a priori for the Existence of God*; another *On Thanksgiving*; and two *On Regeneration.* He also engaged at almost every meeting in the discussion of some controverted point in divinity or philosophy; and it cannot be doubted that these discussions must often have been highly interesting, when such persons engaged in them as Dr Chalmers, whose speeches differed from most of the others in being generally read. Amongst the members at that period were, Mr Duncan, now professor of mathematics at St Andrews, and Sir John Campbell, now attorney-general of England. In one respect Leyden felt and acknowledged his inferiority to the students at St Andrews, namely, in having paid scarcely any attention to mathematics; a study for which he had so little turn, that, by his own account, he could never comprehend the definition of a straight line, owing to some metaphysical difficulty, which nobody could solve to his satisfaction. He appears to have disliked the style of society in St Andrews, where, however, he acquired more than one of his most valued friends, particularly Dr Hunter, and another gentleman of high intellectual capacity and scientific attainments. From the presbytery of St Andrews he received license to preach, in May 1798; and on this occasion he was much disgusted by a vulgar piece of waggery, attempted to be practised, at his expense, by one of the members, who told him, that, as he would be called upon to return thanks after dinner, it was expected that, according to established custom, he should give a specimen of his gifts in prayer, by using a form of words comprehending all the leading doctrines of the Christian faith. When the expected signal was given, Leyden stood up and began to pronounce such a prayer as might have been very suitable for the church; but after having proceeded at some length, and in a very sonorous voice, to enumerate the Divine attributes, he perceived that the company was astonished by this unusual exhibition, and sitting down abruptly in no very placid humour, he was more than half disposed to inflict personal chastisement on the offending individual, with whom he felt enraged, not merely on account of the indignity offered to himself, but for the indecent mockery of one of the solemnities of religion. About this time he returned to Edinburgh, where he frequently preached, not indeed so as to attract popular admiration, but in a manner which satisfied his numerous friends that he possessed a serious, as well as a philosophical mind. His memory was retentive; but, in conducting the devotions of a religious assembly, he was apt to be disconcerted by circumstances which would have given him no uneasiness if he had been addressing a learned society.

In the winter of 1798, he attended some of the medical classes, and at this period nearly lost his life, in consequence of his rash and unskilful treatment of a complaint which he believed to be an attack of colic. He swallowed a glass of spirits, in the expectation of receiving immediate relief; but the disorder proved to be *enteritis*, or inflammation of the intestines, and his constitution was so much weakened by venesection, blistering, and evacuations, that he never afterwards recovered the bloom of health. In addition to his duties as a tutor in a family, by which much of his time was engrossed, he had been engaged as a writer in the *New London Review*, and, amongst other articles, contributed those on Horne Tooke's *Diversions of Purley*, on Dr Thomas Brown's *Observations on Zoonomia*, and on Vallancey's *Sanscrit History of Ireland.*

In the summer of 1799, he published a volume, entitled *A Historical and Philosophical Sketch of the Discoveries and Settlements of the Europeans in Northern and Western Africa, at the Close of the Eighteenth Century.* This interesting piece (an octavo of 442 pages) was written in about six weeks, whilst the author was in bad health, and at a distance from books; but it exhibits proofs of extensive information, as well as of sound reflection. In the course of the autumn he engaged to publish *The Complaynt of Scotland*, a very rare anonymous work in the Scottish language, written early in the sixteenth century. It did not appear for nearly two years; but the preliminary dissertation, extending to nearly 300 pages, as well as the notes and glossary, indicated a compass of antiquarian lore, and a depth of research in various other unfrequented walks of erudition, which could not easily be rivalled. He also displayed great acuteness and ingenuity in attempting to prove, from internal evidence, that *The Complaynt* was the production of Sir David Lindsay.

Through Mr Richard Heber, to whom he was introduced by Mr Constable, he became acquainted with the most distinguished literary characters in Edinburgh, and, amongst others, with Sir Walter Scott, who at this time was engaged in collecting the ancient traditionary rhymes published in the *Minstrelsy of the Scottish Border;* a collection which Leyden contributed largely to enrich, both by recovering unedited fragments of antiquity, and by communicating imitations, written in the spirit and manner of the age of chivalry, as well as by furnishing materials for many of the notes, and particularly for the introduction to the tale of *Tamlane*, containing a learned dissertation on the Fairies of popular superstition.

In the year 1800, a plan was formed to establish him as assistant and successor to the minister of his native parish'; but it failed, in consequence of the reluctance of the incumbent to agree to an arrangement on which the heritors and parishioners had set their hearts. Soon afterwards, he was anxious to obtain the professorship of rhetoric and belles lettres in Edinburgh; but here also he was doomed to experience a disappointment.

About this time he made two successive tours through the Highlands, and collected much curious information, which was once intended for publication. He wrote several poems, founded on the remains of Celtic story, two of which have been inserted in the *Border Minstrelsy*. In 1801, he also contributed to Lewis's *Tales of Wonder.*

The year 1802, the last which he spent in Scotland, was one of the busiest of his life. About the beginning of the year, he had carried through the press nearly half a volume of an enlarged *Account of the Progress of Discovery in Africa.* At the same time he engaged to conduct the *Scots Magazine*, on an improved plan; and the volume for that year contains many articles furnished by him, and by another eminent orientalist, the late Dr Alexander Murray. He was also employed in correcting the papers of the Highland Society for publication; and he edited a volume entitled *Scottish Descriptive Poems, with some Illustrations of Scottish Literary Antiquities*, containing *Clyde*, by John Wilson, schoolmaster of Greenock; *Albania*, addressed to the Genius of Scotland; *The Day Estival*, by Alexander Hume; and *Poems*, by William Fowler. Early in this year, he offered to the African Society to explore the interior of those obscure and inhospitable regions in which so many Europeans have perished. His friends, alarmed at this apparently fatal resolution, became eager to obtain for him an Indian appointment, that might give him access to the treasures of eastern learning, which his past attainments peculiarly qualified him to appreciate. Through the interest of Mr William Dundas, he was nominated assistant surgeon; and though it was privately stipulated, that, on his arrival in India, he was to devote himself chiefly to literary inquiries, he could not be permitted to go out as a passenger in that capacity, without producing a surgeon's diploma, and undergoing an examination before the Medical Board. He had attended many of the medical classes, but he had hitherto paid little attention to the practice of surgery, and it was therefore necessary to prepare himself for passing through the strict trials prescribed by the college of surgeons. It reflects no slight credit on his capacity and application, that he accomplished this task within six months. He was not equally successful in procuring the degree of doctor of physic from the university of Edinburgh; but having gone to St Andrews with certificates of his character and regular education, and having satisfied the Senatus Academicus at a private examination, as well as by reading several exercises prescribed to him in the Latin language, that degree was conferred on him there, on the 7th of August 1802. Whilst he was occupied in these unpoetical avocations, he continued at every interval of leisure to court the inspiration of the muses, and he gave the finishing hand to the *Scenes of Infancy, descriptive of Teviotdale*, a poem which had been partly written before, but which was now enlivened by some of its most touching passages, and left for publication in the hands of Dr Thomas Brown, who, in the revision of the sheets, suppressed a number of verses which the author conceived ought to have been retained.

Leyden spent the winter in London, having narrowly escaped the misfortune of sailing in the Hindostan, which was wrecked in its passage down the Thames. He sailed from Portsmouth in the Hugh Inglis, on the 7th of April 1803, and soon after his arrival at Madras, was attached as surgeon and naturalist to the commission for surveying the districts of the Mysore, in which capacity he was expected to turn his attention, not only to the natural history of the country, but to the manners, institutions, and language of the inhabitants. His constitution had nearly sunk under the labours to which he subjected himself, and he was under the necessity of removing to Prince of Wales's Island. Here he was befriended by the governor, Mr Dundas, and here too he procured the chief materials of the *Essay on the Languages and Literature of the Indo-Chinese Nations*, contained in the tenth volume of the *Asiatic Researches.*

He removed in 1806 from Prince of Wales's Island to Calcutta, where, through the favour of the governor-general, Lord Minto, he was appointed one of the professors in the Bengal College, from which station he was soon transferred to the office of judge of the Twenty-four Pergunnahs of Calcutta. The income attached to this charge was applied chiefly in purchasing manuscripts, and rewarding the native teachers whose instructions he solicited; and all his leisure hours were spent in the eager investigation of the languages, the laws, and history of the East. In 1809 he was appointed a commissioner of the court of requests in Calcutta, and, in the end of the following year, having resigned this office, he obtained the office of assay-master of the mint. Soon afterwards, he was required to attend Lord Minto upon the expedition to Java, that he might be employed in collecting information with respect to the learning and institutions of the native tribes, and that the governor-general might enjoy the benefit of his services in negotiating with the local authorities, and in adjusting the future government of the country. After the British troops took possession of the city of Batavia, he ventured rashly into an ill-aired library, supposed to contain many Indian manuscripts, and, on leaving it, was immediately seized with a fever, which proved fatal three days after its accession, and a few days before the conquest of the island was completed. He died on the 21st of August 1811.

A very high tribute to his memory was paid by Lord Minto, on occasion of a visitation of the College of Fort-William, after his lordship's return from the conquest of Java. "To speak of all that Dr Leyden had already performed, especially in the prosecution of Asiatic learning—to compute the treasures which his incomparable genius, urging and sustaining his invincible powers of mental labour, presented the fair promise of acquiring and accumulating—would be to relate a history of the short but memorable life he was allowed to live, and to expatiate into the yet more ample fields of inquiry of which he had projected the survey. I need not remind those who hear me, of the zeal he had long nourished for exploring the philology of the more eastern regions of Asia; of the first steps he had already made in the prosecution of that purpose, by the construction of vocabularies, but, above all, by methodising and reducing into system the classification of the various languages spoken on the continent intermediate between India and China; the various kingdoms and districts of which, as they recede from each of these extreme points, appear, with some relation to their local approximation, or to historical affinities, gradually to have blended and assimilated their respective languages into compound dialects, partaking of both the distinct and primitive tongues. To this just and authorized tribute to the literary merits of Dr Leyden, I must yet add a personal testimony, prompted by personal experience, to virtues of a higher class, neither connected with the talents and toils of a student, nor so uniformly the companions of learned reputation, as it would be natural perhaps to wish and to expect. But I speak it in the presence of many who can attest it with myself, that, founder as he was of his own fortunes and reputation, and climbing, by many laborious steps, from the lowest stage of social life, to an eminence which many cannot even maintain, though placed yet higher by their birth; no man, whatever his condition might be, ever possessed a mind so entirely exempt from every sordid passion, so negligent of fortune and all its grovelling pursuits, in a word, so entirely disinterested, nor ever owned a spirit more firmly and nobly independent. I speak of these things with some knowledge, and wish to record a competent testimony to the facts, that, within my experience, Dr Leyden never, in any instance, solicited an object of personal interest, nor, as I believe, ever interrupted his higher pursuits, to waste a moment's thought on those minor cares. To this exemption from cupidity was allied every generous virtue worthy of those smiles of fortune which he disdained to court; and amongst many estimable features of his character, an ardent love of justice, and a vehement abhorrence of oppression, were not less prominent than the other higher qualities I have already described."

Sir John Malcolm bears testimony, in terms equally strong, to the purity, disinterestedness, and independence of his character, as well as to the indefatigable perseverance and ardour with which he devoted himself to literary and scientific acquirements; and, after adverting to some rather unpleasing oddities of manner, "How trivial," he adds, "do these appear, at a moment when we are lamenting the loss of such a rare combination of virtues, learning, and genius, as were concentrated in the late Dr Leyden."

(See *Edinburgh Annual Register for* 1811; and *The Poetical Remains of the late Dr John Leyden, with Memoirs of his Life*, by the Rev. James Morton, 8vo, London, 1819.) (P. P. P.)

LEYRIA, a city of Portugal, in the province of Estremadura. It is situated on the banks of the river Lis, at its confluence with a smaller stream, and was formerly a royal residence, well fortified. Its inhabitants are now estimated to amount to 4000. It is the see of a bishop, and contains a cathedral, two parish churches, an hospital, an almshouse, and 630 houses.

LEYTA, one of the southernmost of the Philippines, ninety-five miles in length by thirty-eight in breadth. The soil is fertile, and the mountains abound in deer, wild hogs, and fowls. The air is pure, healthy, and temperate. A chain of mountains runs through the island in a direction north-west and south-east; and so materially do they influence the climate, that the seasons are entirely different on opposite sides of the mountains. The inhabitants amount to 9000, who pay a tribute in wax, rice, or cloth. Long. 124. 40. E. Lat. 10. 50. N.

LEYTON, Low, a village in the hundred of Becontree, in the county of Essex, six miles from London, on the border of Epping Forest. It is chiefly filled with houses used as country-seats by the richer traders of the metropolis, and is supposed to have been a Roman station under the name of Durolitum. The population amounted in 1801 to 2519, in 1811 to 3162, in 1821 to 3374, and in 1831 to 3223.

LEZOUX, a city of France, in the department of the Puy-de-Dome, and arrondissement of Rioum, containing an hospital, 570 houses, and 3450 inhabitants.

LHUYD, or Lhoyd, *Humphrey*, a learned antiquary of the sixteenth century, born at Denbigh. He applied himself to the study of physic, and, living mostly within the walls of Denbigh Castle, practised there as a physician, and died in 1570, with the character of a well-bred gentleman. He wrote and translated several pieces relative to history and antiquities, particularly the History of Cambria, or Wales, from Caradoc of Langcarvan, which, however, he did not live to finish; but Sir Henry Sidney, lord-president of Wales, employed Dr David Powel to complete it, and by him it was published in 1584. A new and improved edition of this work was published in 1774.

Lhuyd, *Edward*, keeper of the museum at Oxford, was a native of South Wales, and the son of Mr Charles Lhuyd of Lhanvorde. He was educated at Jesus College, Oxford, where he was created master of arts in July 1701. He was bred under Dr Plot, whom he succeeded as keeper of the Ashmolean Museum, and had the use of all Vaughan's collection. With incessant labour and great exactness he employed a considerable part of his life in searching into the Welsh antiquities, and perused or collected a great deal of ancient and valuable matter from their manuscripts; transcribed all the old charters of the monasteries that he could meet with; travelled several times over Wales, Cornwall, Scotland, Ireland, and Armorica (Bretagne), countries inhabited by the same people; compared their antiquities, and made observations on the whole. But he died in July 1709, before he had digested them into the form of a treatise, as he intended, on the ancient inhabitants of this island. The untimely death of this excellent antiquary prevented the completion of many admirable designs. For want of proper encouragement, he did very little towards illustrating the British bards, having seen but one of those of the sixth century, and not being able to procure access to two of the principal libraries in the country. He communicated many observations to Bishop Gibson, whose edition of the *Britannia* he revised; and he published *Archæologia Britannica*, giving some further account of the language, history, and customs of the original inhabitants of Great Britain, from collections and observations made in travels through Wales, Cornwall, Bretagne, Ireland, and Scotland. He left in manuscript a Scottish or Irish-English Dictionary, proposed to be published in 1732 by subscription, by Mr David Malcolm, a minister of the church of Scotland, with additions; as also the Elements of the same Language, with necessary and useful information, for propagating more effectually the English language, and for promoting the knowledge of the ancient Scottish or Irish, besides many branches of useful and curious learning. Lhuyd, at the end of his preface to the *Archæologia*, promises an historical dictionary of British persons and places mentioned in ancient records; and it seems to have been ready for press, though he could not fix the time of publication. His collections for a second volume, which was to give an account of the antiquities, monuments, and remains, in the principality of Wales, were numerous and well chosen; but, on account of a quarrel between him and Dr Wynne, then fellow, and afterwards principal, of the college, and bishop of St Asaph, he refused to buy them, and they were purchased by Sir Thomas Sebright of Beachwood, in Hertfordshire. They consist of about forty volumes in folio, ten in quarto, and above a hundred of smaller size, all relating to Irish or Welsh antiquities, and chiefly in those languages. Carte made extracts from them about 1736; but these were chiefly historical. Sir John Sebright gave to Mr Pennant twenty-three of Lhuyd's manuscripts, in Latin and English. Many of his letters to Lister, and other learned contemporaries, were presented by Dr Fothergill to the University of Oxford, and are now in the Ashmolean Museum. Lhuyd undertook art more for illustrating the Celtic part of the kingdom than any man besides ever attempted.

LIANCOURT, a town of the arrondissement of Clermont, in the department of the Oise. It is situated on the river Bresche, and contains about 1200 inhabitants; and it is remarkable for the castle and park of the duke of the same name. It is celebrated for its manufactures of cambrics, lenos, lawns, and cotton goods of the finer kinds.

LIBANIUS, a Greek rhetorician and sophist in the fourth century, was born at Antioch, and shared the friendship of Julian the Apostate. That prince offered him the dignity of *prœfectus prœtorio;* but Libanius refused it, thinking the name of sophist, or professor of eloquence, much more honourable. There are still extant several of his letters and Greek orations, by which he acquired great reputation; but his style is somewhat affected and obscure. St Basil and St Chrysostom were his disciples about the year 360. His letters were published at Amsterdam in 1738, and his Orations at Venice in the year 1755. Libanius was a pagan.

LIBANOMANTIA, in *Antiquity*, a species of divination, performed with frankincense, which, if it presently caught fire, and sent forth a grateful odour, was esteemed a happy omen, and *vice versâ*.

LIBANUS, a lofty mountain of Syria, the ancient Lebanon, so celebrated in Scripture. Its direction is nearly north and south, from the vicinity of Tripoli to the borders of Palestine. Its distance from the Mediterranean is from thirty to forty miles. To the east there is the parallel chain of Anti-Libanus, which is covered with snow at its summit. The exact height of the mountain of Lebanon has not been ascertained. Mr Buckingham ascended to its summit; but he does not state its precise height, which must be considerable, as it is covered with snow to an unknown depth at all seasons; for he mentions, that though his horses sometimes sunk to the belly, they never were able to penetrate to the ground. The cedars of Lebanon, so often mentioned, still flourish at a lower level on the hill. Mr Buckingham saw about 200 cedar trees, all fresh and green. Some of them were very large, the trunk ten or twelve feet in diameter, with branches of corresponding size, each of them like large trees extending outward from the parent stock, and overshadowing a large space of ground. The view from the summit was magnificent, embracing the boundless prospect of the ocean to the westward, with the coasts of Syria. To the east the prospect was interrupted by the range of Anti-Libanus. The mountain consists of a species of limestone, which presents frequently the appearance of towers and castles.

LIBATION, amongst the Greeks and Romans, was an essential part of solemn sacrifices. It was also performed alone, as a drink-offering, by way of procuring the protection and favour of the gods in the ordinary affairs of life. Libations, according to the nature of the gods in honour of whom they were made, consisted of different liquids, but wine was that most usually employed. The wine offered to the gods was always unmixed with water. There were libations of water, libations of honey, libations of milk, and libations of oil, called *νηφαλια ἱερα*. The libation was made with a serious deportment and solemn prayer. At sacrifices, the libation, after it had been tasted by the priest, and handed to the bystanders, was poured out upon the victim. At entertainments a little wine was generally poured out of the cup, before the liquor began to circulate, to show the gratitude of the guests to the gods for the blessings they enjoyed.

Libations were likewise in use amongst the Hebrews, who poured out a kind of wine on the victim after it was killed; and the several pieces of the sacrifice were laid upon the altar, ready to be consumed in the flames.

LIBEL (*libellus famosus*), taken in its largest and most extensive sense, signifies any writing, picture, or the like, of an immoral or illegal tendency; but, in a peculiar sense, it denotes a malicious defamation of any person, and especially of a magistrate, made public either by printing or by writing, by signs or by pictures, in order to provoke him to wrath, or expose him to public hatred, contempt, and ridicule. The direct tendency of these libels is a breach of the public peace, by stirring up the objects of them to revenge, and perhaps to bloodshed. The communication of a libel to any one person is a publication in the eye of the law, and therefore the sending an abusive private letter to a man is as much a libel as if it were openly printed, for it equally tends to provoke a breach of the peace.

With regard to libels in general, there are two remedies; one by indictment, and another by action. For the public offence, the remedy is indictment; because every libel has a tendency to break the peace, or provoke others to break it, an offence which is the same whether the matter contained be true or false; and therefore the defendant, on an indictment for publishing a libel, is not allowed to allege the truth thereof by way of justification. But in the remedy by action on the case, which is to repair the party in damages for the injury done him, the defendant may, as for words spoken, justify the truth of the facts, and show that the plaintiff has received no injury at all. What has been said with regard to words spoken, will also hold in every particular with regard to libels by writing or printing, and the civil actions consequent thereon; but as to signs or pictures, it seems necessary always to show, by proper inuendos and averments of the defendant's meaning, the import and application of the scandal, and that some special damage has followed; otherwise it cannot appear that such libel by picture is understood to have been levelled at the plaintiff, or that it was attended with any actionable consequences.

In a civil action, then, a libel must appear to be false as well as scandalous; for, if the charge be true, the plaintiff has received no private injury, and has no ground to demand a compensation for himself, whatever offence it may be against the public peace; and therefore, upon a civil action, the truth of the accusation may be pleaded in bar of the suit. But, in a criminal prosecution, the tendency which all libels have to create animosities, and to disturb the public peace, is the sole consideration of the law. Hence, in such prosecutions, the only points to be considered are, first, the making or publishing of the book or writing; and, secondly, whether the matter be criminal; and, if both these points are against the defendant, the offence against the public is complete. The punishment of such libellers, for concocting, repeating, printing, or publishing the libel, is a fine, and such corporal punishment as the court in its discretion may inflict; regard being had to the quantity of the offence, and the quality of the offender. By the law of the Twelve Tables at Rome, libels which affected the reputation of an individual were made a capital offence; but before the reign of Augustus, the punishment became corporal only. Under the Emperor Valentinian it was again made capital, not only to write, but to publish, or even to omit destroying libels. In this and many other respects, our law corresponds rather with the middle age of Roman jurisprudence, when liberty, learning, and humanity, were in their full vigour, than with the cruel edicts that were established in the tyrannical age of the ancient decemviri, or in that of the latter emperors.

LIBELLA, a piece of money amongst the Romans, being the tenth part of the denarius, and equal in value to the *as*. It was called *libella*, as being a little pound, because equal to a pound of brass.

LIBELLI, the name given to the bills which were put up amongst the Romans, giving public notice of the time when a show of gladiators would be exhibited, with the number of the combatants, and other circumstances. This was called *munus pronunciare* or *proponere*. The *libelli* or bills were sometimes termed *edicta*. These public notices were given by the person who intended to oblige the people with a show, and were frequently attended with pictures representing the engagement of some celebrated gladiators. There was also the *famosus libellus*, or defamatory libel. Seneca calls them *contumeliosi libelli*, infamous rhymes, which, by a Roman ordinance, were punishable with death. *Libellus* in the civil law also signifies the declaration, or state of the prosecutor's charge against the defendant; and it has the same signification in the English spiritual courts.

LIBERA, in *Mythology*, the name of a goddess, which Cicero, in his book *De Natura Deorum*, represents as the daughter of Jupiter and Ceres. Ovid, in his *Fasti*, says, that the name was given by Bacchus to Ariadne. Libera is exhibited on medals as a kind of female Bacchus, crowned with vine leaves.

LIBERAL ARTS, are such as depend more on the labour of the mind than on that of the body; or, which consist more in speculation than operation, and have a greater regard to enlightened amusement and curiosity than to necessity. The word comes from the Latin *liberalis*, which amongst the Romans signified a person who was not a slave, and whose will consequently was not checked by the command of any master. The liberal arts, including under this name rhetoric, painting, sculpture, music, and architecture, used formerly to be summed up in the verse,

> Lingua, Tropus, Ratio, Numerus, Tonus, Angulus, Astra ;

and the mechanical arts, which are innumerable, under

> Rus, Nemus, Arma, Faber, Vulnera, Lana, Rates.

See the article Arts.

LIBERALIA, feasts celebrated by the ancient Romans, in honour of Liber or Bacchus, and the same with those which the Greeks called *Dionysiaca*. They derived their name from *liber*, free, a title conferred on Bacchus in memory of the liberty or freedom which he granted to the people of Bœotia; or, perhaps, because wine, of which he was the reputed deity, delivers men from care, and sets their minds at ease and freedom. Varro derives the name of this feast from *liber*, free, because the priests were free from their function, and eased of all care, during the time of the *liberalia;* as the old women officiated in the ceremonies and sacrifices of these feasts.

LIBERIA, an American colony, situated on the western coast of Africa. This territory was purchased from the native chiefs in 1821, by the American Colonization Society, for the purpose of forming an establishment for liberated negroes belonging to America, who, by the prejudices of the country, are regarded as beings of an inferior order. It is situated in that part of Africa called Grand Bassa, a part of the Grain Coast of Guinea, about 300 miles south of Sierra Leone; and its capital, which is called Monrovia, stands on an island at the mouth of the Mesurado, called Cape Mesurado or Montserrado, longitude 10. 36. 30. west, latitude 6. 15. 0. north. The territory presents the form of a narrow tongue of twelve leagues in extent, and is connected with the mainland by a narrow isthmus, formed by the approach of the head waters of the Montserrado and Junk Rivers. Cape Montserrado, the north-western termination of this linear tract of country, rises to a promontory sufficiently majestic to present a bold distinction from the uniform level of the coast. Towards the south-east, Liberia is terminated by the mouth of the Junk River. The country upon the coast is low, but it gradually rises towards the interior; and at a distance of from twenty to thirty miles from the sea, hills of considerable elevation are visible. It is fertile, healthy, and in every way adapted to the purpose for which it was obtained from the natives. About forty-eight miles due north-west from Cape Montserrado, is Grand Cape Mount, which rises from a level country, on a base of about four miles in diameter, about 900 feet above the sea, which washes it on three sides. This mount, the north-western extremity of Liberia Bay, is covered with a deep and unfading foliage. Several springs of excellent water descend from it, and the Pisson River empties itself into the ocean on its northern side. The St Paul's River, which flows into Liberia Bay, is of considerable magnitude, and is supposed to admit, above its falls, which are about twenty miles from its mouth, of boat navigation, for 200 or 300 miles. The Montserrado River is forty miles long, and enters the sea on the northern side of the cape of the same name. In the Junk district, south-east of Cape Montserrado forty miles, are two considerable rivers, which pour their waters into the ocean at the distance of only two miles from each other. The river St John's, eighty-one miles south-east from Cape Montserrado, is the largest of all, and navigable for vessels of from 90 to 100 tons, abounding with fish, and having its course through a fertile and salubrious country, of a rich soil. Cape Montserrado is elevated about eighty feet above the ocean, is washed on three sides by the water, is connected with a level tract of land on the fourth, and comprehends about 1600 acres. The town of Monrovia, the capital of the settlement, is situated on the inland side of the peninsula which forms the south-west bank of the river Montserrado, about two miles within the extremity of the cape. The original settlement approached within 150 yards of the water, and occupied the highest part of the ridge, which traverses a large part of the peninsula, and rises at this place to about seventy-five feet. A dense and lofty forest, entangled with vines and brushwood, so as to be nearly impracticable by any but the feet of savages and wild beasts, formed the majestic covering of a large portion of this tract, when the territory was purchased by the American Colonization Society.

Opposite the town of Monrovia, and near to the mouth of the Montserrado River, are two small islands, containing together about three acres of ground. The largest of these islands is nearly covered with houses built in the native style, and was for some time occupied by a number of domestic slaves, formerly held in a state of qualified vassalage, very common in Africa, by a black man, to whom the right of the original owner had devolved after his return to Europe. The tribes in the neighbourhood are, first, the Deys, who inhabit the coast from twenty-five miles to the northward of Montserrado, to the mouth of the Junk, about thirty-six miles to the south-eastward; contiguous to this nation, and next interior, are the Queahs, whose country lies to the east of Cape Montserrado; and, lastly, the Garrahs, a much more numerous race of men, who occupy the country to the northward of the upper parts of the St Paul River. Still farther towards the interior is the formidable and warlike nation of the Condoes, the terror of all their maritime neighbours. About a mile to the northward of the settlement, a portion of the beach is occupied by the Kroomen, who are the watermen and pilots of the country. They originate from a populous maritime tribe, whose country is Settra-Kroo, near Cape Palmas. The articles to be obtained by trade at Liberia are chiefly ivory, camwood, gold, tortoise-shell, hides, the teeth of the sea-horse, and a small quantity of coffee. The country abounds in cattle, goats, swine, and fowls, and in most of the fruits and vegetable productions of other tropical climates. The first efforts of the American Colonization Society were attended with considerable success. Great numbers of free people of colour were transported to Liberia, and some improvement was effected both in their condition and their character. Those who had been slaves were transformed into masters; and, from being a depressed and degraded being in America, the freed negro found himself raised to the level of those who had formerly been his task-masters and oppressors. In theory the plan of the American Colonization Society was excellent, and indeed it appears to be the only one by which civilization can be introduced into Africa. Natives of Africa alone possess physical constitutions which are proof against the climate; and to operate by a continuous force, as it were, is the only way to make an impression upon the country, or to effect a change in the moral deportment of its inhabitants. The scheme was not only praiseworthy, as far as the freed men of colour were themselves concerned, but in regard to the land of their nativity it might have effected an important change. Unfortunately, however, almost every prospect of success has been blasted by the native Africans, who, in 1835, attacked the colonists, and massacred a number of the inhabitants; and by the most recent accounts, it appears that they are in continual danger of entire extirpation.

Liberia, in Roman antiquity, a festival observed on the 16th of the kalends of April, at which time the youth laid aside their juvenile habit for the *toga virilis*, or habit peculiar to grown men.

LIBERTINES, Libertini, in ecclesiastical history, a religious sect which arose in the year 1525, and the principal tenets of which were, that the Deity was the sole operating cause in the mind of man, and the immediate author of all human actions; that, consequently, the distinctions of good and evil, which had been established with regard to those actions, were false and groundless; that men could not, properly speaking, commit sin; that religion consisted in the union of the spirit or rational soul with the Supreme Being; that all those who had attained this happy union, by sublime contemplation and elevation of mind, were allowed to indulge, without exception or restraint, their appetites or passions; that all their actions and pursuits were then perfectly innocent; and that, after the death of the body, they became united to the Deity. This sect likewise held that Jesus Christ was nothing but a mere entity, composed of the spirit of God, and of the opinion of men. These maxims occasioned their being called *Libertines;* and the word has been employed in a bad sense ever since.

The *Libertini* spread principally in Holland and Brabant. Their leaders were one Quintin, a native, Picards, Pockesius, Ruffus, and another person called Chopin, who joined Quintin, and became his disciple.

This sect obtained a certain footing in France through the favour and protection of Margaret, queen of Navarre, sister of Francis I., and it found patrons in several of the reformed churches. It was probably a remnant of the more ancient Beguards, or Brethren of the Free Spirit.

Libertines of Geneva, were a cabal of rakes rather than of fanatics; for they made no pretence to any religious system, but pleaded only for the liberty of leading voluptuous and immoral lives. This cabal was composed of a certain number of licentious citizens, intolerant of the severe discipline of Calvin, who punished with rigour not only dissolute manners, but also whatever bore the aspect of irreligion and impiety. In this turbulent cabal there were several persons who were not only notorious for their dissolute and scandalous manner of living, but also for their atheistical impiety, and contempt of all religion. To this odious class belonged one Gruet, who denied the divinity of the Christian religion, the immortality of the soul, and the difference between moral good and evil, and who rejected with disdain the doctrines that are held most sacred among Christians; impieties for which he was at last brought before the civil tribunal, in the year 1550, and condemned to suffer death. At this time the Genevan spirit of reformation, directed by the excessive zeal of Calvin, tended to defeat itself, and to introduce the greatest disorders. In 1544, Castalio, master of the public school of that city, a man of probity, and distinguished by his learning and taste, was, nevertheless, deposed from his office and banished the city, because he disapproved of some of the measures which were pursued, as well as of the opinions entertained by Calvin and his colleagues, particularly that of absolute and unconditional predestination. Jerome Bolsec, also a man of genius and learning, who became a convert to the Protestant religion, and fled to Geneva for protection, was cast into prison, and soon afterwards driven into exile, because, in 1551, he imprudently declaimed, in full congregation, against the doctrine of absolute decrees.

LIBERTUS, or Libertinus, amongst the Romans, a freedman, or a person set free from a legal servitude.

Persons of this class still retained some mark of their ancient state, he who made a slave free having a right of patronage over the *libertus;* so that if the latter failed in showing due respect to his patron, he was restored to his servitude, and if the *libertus* died without children, his patron was his heir.

In the early age of the republic, *libertinus* denoted the son of a *libertus* or freedman; but afterwards, that is, before the time of Cicero, and under the emperors, the terms *libertus* and *libertinus* were used as synonymous.

LIBERTY denotes a state of freedom, in contradistinction to slavery or restraint, and may be considered either as *natural* or as *civil.*

The absolute rights of man, considered as a free agent, endowed with a discernment to distinguish good from evil, and with a power of choosing those measures which appear to him to be most desirable, are usually summed up in one general appellation, and denominated the *natural liberty of mankind.* This natural liberty consists properly in a power of acting as one thinks fit, without any restraint or control, unless by the law of nature; being a right inherent in us by birth, and one of the gifts of God to man at his creation, when he endowed him with the faculty of free-will. But every man, when he enters into society, gives up a part of his natural liberty, as the price of so valuable a purchase; and, in consideration of receiving the advantages of mutual commerce and of protection, obliges himself to conform to those laws which the community has thought proper to establish. This species of legal obedience and conformity is therefore infinitely more desirable than that wild and savage liberty which is sacrificed to obtain it. For no man, who considers for a moment, would wish to retain the absolute and uncontrolled power of doing whatever he pleased, because every other man would have the same power, and then there would be no security to individuals in any of the enjoyments of life.

Civil liberty, therefore, which is that of a member of society, is no other than natural liberty, restrained by human laws, as far as is necessary and expedient for the advantage of the public. Hence we may collect, that the law, which restrains a man from doing mischief to his fellow-citizens, though it diminishes the natural, increases the civil liberty of mankind; but every wanton and causeless restraint of the will of the subject, whether practised by a monarch, a nobility, or a popular assembly, is a degree of tyranny. Even laws themselves, whether made with or without our consent, if they regulate and constrain our conduct in matters of mere indifference, without any good end in view, are laws destructive of liberty; but if any public advantage can arise from observing such precepts, the control of our private inclinations, in one or more points, will conduce to preserve our general freedom in others of more importance, by supporting that state of society which alone can secure our independence. Thus the statute of Edward IV. which forbade the fine gentlemen of his time to wear pikes upon their shoes or boots of more than two inches in length, was a law that savoured of oppression, because, however ridiculous the fashion then in use might appear, the restraining it by pecuniary penalties could serve no purpose of general utility. But the statute of Charles II. which prescribed a thing apparently as indifferent, viz. a dress for the dead, who were ordered to be buried in woollen, was a law consistent with public liberty; for it encouraged the staple trade, on which in great measure depended the prosperity of the nation. Hence laws, when prudently framed, are by no means subversive, but rather introductive, of liberty; for, as Mr Locke has well observed, where there is no law there is no freedom. But then, on the other hand, that system of laws is alone calculated to maintain civil liberty, which leaves the subject entire master of his own conduct, excepting as to those points in which the public good requires some direction or restraint.

The idea and practice of this civil liberty flourish in their highest vigour in these kingdoms, where it falls little short of perfection, and can only be lost or destroyed by the folly or demerits of its owner; the legislature, and of course the laws of Britain, being peculiarly adapted to the preservation of this inestimable blessing even in the meanest subject. And this spirit of liberty is so deeply implanted in our constitution, and rooted even in our very soil, that a slave or a negro, the moment he lands in Britain, falls under the protection of the laws, and so far becomes a freeman, though his master's right to his service may possibly still continue.

The absolute rights of every Briton, as they are founded on nature and reason, so they are coeval with our form of government, though subject at times to fluctuation and change; their establishment, excellent as it is, being still human. At some periods we have seen them depressed by overbearing and tyrannical princes; at others, so luxuriant as even to tend to anarchy, a state worse for the time than tyranny itself, as any government is better than none at all. But the vigour of our free constitution has always delivered the nation from these embarrassments; and, as soon as the convulsions consequent on the struggle have ceased, the balance of our rights and liberties has settled at its proper level; whilst their fundamental articles have been asserted in parliament, as often as they were thought to be in danger. See the articles GOVERNMENT and LEGISLATION.

LIBERTY and Necessity. See METAPHYSICS.

LIBERTY OF THE PRESS.

I.—NATURE AND OBJECTS OF THE INQUIRY.

THE task of pointing out which of the acts, capable of being committed by the press, it would be expedient to prohibit under penalties, we trust will be found to be greatly diminished, by what we have already established in the articles GOVERNMENT and JURISPRUDENCE.

There is scarcely a right, for the violation of which, scarcely an operation of government, for the disturbance of which, the press may not be employed as an instrument. The offences capable of being committed by the press are indeed nearly co-extensive with the whole field of delinquency.

It is not, however, necessary to give a separate definition of every such violation or disturbance, when committed by the press; for that would be to write the penal code a second time, first describing each offence as it appears in ordinary cases, and then describing it anew for the case in which the press is the particular instrument.

If, for the prevention of the violation of rights, it were necessary to give a separate definition, on account of every instrument which might be employed as a means of producing the several violations, the penal code would be endless. In general, the instrument or means is an immaterial circumstance. The violation itself, and the degree of alarm which may attend it, are the principal objects of consideration. If a man is put in fear of his life, and robbed of his purse, it is of no consequence whether he is threatened with a pistol or with a sword. In the definition of a theft, of a fraud, or of a murder, it is not necessary to include an account of all the sorts of means by which these injuries may be perpetrated. It is sufficient if the injury itself be accurately described. The object is to prevent the injury, not merely when produced by one sort of means or another sort of means, but by any means.

From these illustrations, it sufficiently appears, that, if an accurate penal code were composed, defining the violations of rights, and the disturbances of the operations of government, to which penalties were to be annexed, every offence capable of being committed by the press would be defined without mentioning the press. It is no less evident, that if we include in the term *libel*, as, to the great encouragement of confusion, is generally done, all the offences capable of being committed by the press, we include in the definition of libel all the definitions of the penal code.

As far as persons and property are concerned, the general definition of the acts by which rights are liable to be violated, has always been held sufficient; and has been regarded as including not less the cases in which the instrumentality of the press has been employed, than those in which any other means have been employed to the same end. Nobody ever thought of a particular law for restraining the press on account of the cases in which it may have been rendered subservient to the perpetration of a murder or a theft. It is enough that a law is made to punish him who has been guilty of the murder or theft, whether he has employed the press or any thing else as the means for accomplishing his end.

There can be no doubt, however, that the press is an instrument peculiarly adapted for the commission of injuries against reputation, and for effecting disturbance to the operations of government, while it has no peculiar adaptation for the commission of other offences. Here, too, there is the greatest disposition to restrain the press within improper limits. It is demanded of us, therefore, upon this part of the subject, to enter into greater detail.

We are then to inquire, in the first place, What are the acts of the press with respect to *private reputation;* and next, What are the acts with respect to *government,* which it is desirable that punishment should be employed to restrain.

II.—OFFENCES OF THE PRESS, WITH RESPECT TO PRIVATE RIGHTS.

Agreeably to the principles which have been already considered in the article JURISPRUDENCE, no act can be regarded as an offence with respect to an individual, which is not a violation of some of his rights.[1]

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[1] In the description which follows of that violation of rights which is most liable to be committed by the press, and of the mode

Liberty of the Press.

In considering the rights which ought to be established with respect to reputation, one proposition may be assumed; that every man should be considered as having a right to the character which he deserves; that is, to be spoken of according to his actions.

Such Offences should be defined.

In what manner the definition of this right, which would form a part of the civil code, should be expressed, is not now the question; it is evident there is no peculiar difficulty in the matter. As words, not thoughts, are the object of legal cognizance, the right can only have respect to security against certain words; words, imputing to the individual actions which he has not performed, or a disposition to certain actions, without evidence that such a disposition exists.

Suppose that one man has instituted a suit against another, for the offence of having violated, through the press, his right to some part of the reputation which he deserves. In his ground of complaint he must affirm that the man has imputed to him either the performance of actions which he did not commit, or a disposition to certain actions, where no evidence of such disposition can be given.

The words are produced; and the first question is, whether they do or do not impute the actions which, in the complaint, or bill of accusation, they are alleged to impute?

It is to be observed, that they who oppose the attempt to define the offences, which, for shortness, we call the offences of the press, make use of such occasions as this to raise their objections. How, they ask, can all the forms of expression be defined, by which the imputation of such and such actions may be, either more openly, or more covertly, conveyed?

It is very evident that the question, on such an occasion, whether the words do or do not impute such or such actions, is a question of fact. The law says, that such and such actions shall not be imputed, defining the actions. Whether such and such a man has imputed such actions, and whether by one set of words, or another set of words, are questions of fact.

The law, when it said that such and such acts should not be imputed to a man, could not determine whether A, who is accused by B of having imputed to him one of those acts, did so or not. That is to be determined by evidence bearing upon the point. One, and in general the main article of that evidence, are the words which have been used. What is the import of these words, or, which comes to the same thing, what is the degree of proof involved in them, is to be determined, as all questions respecting the weight of evidence are, in each instance, to be determined, by the tribunal before which the accusation is brought. The interpretation of words rests upon the same footing in this, as in all other cases, that, for example, of a will. The law determines, that whatsoever disposition a man has made with respect to his property, shall take effect after his death. But whether A has left his manor of Dale to B, is a matter of fact to be determined by evidence applying to that particular point; principally by that arising from the words of the will.

It may still be argued, by persons who do not easily renounce an opinion to which they have once given their support, that the actions, the imputation of which, the legislature means to prohibit, cannot be defined.

But this is a position which cannot long be maintained.

It is hurtful to a man, if he is believed to have committed some actions, or to have a disposition to commit them; it is not hurtful in the case of others. Evidently it is by imputation of the first sort alone, that any right with respect to reputation can be infringed.

The acts which a man receives injury from being believed to have committed, or to be disposed to commit, are either those to which the law has annexed penalties, or those to which the penalties of public disrepute and dislike are annexed.

With respect to those acts to which the law has annexed penalties, as theft, murder, perjury, and so on, it will not be pretended that there is any difficulty; the law has already defined them, or ought to define them, and they may be marked with perfect precision by a few words.

Those acts which it is hurtful to a man, solely on account of the disrepute and dislike which they produce, to have it believed that he has committed them, may also be with sufficient accuracy determined.

Compensation should be made to the Individual for Injuries sustained by Offences of the Press.

The ends to be attained by punishment are, Reparation to the individual to whom injury has been done, and Prevention of similar acts in future.

In the idea of all punishment, effectual reparation to the injured individual is a necessary and essential ingredient. Suppose, then, it were declared by the legislature that every imputation to a man of acts which bring the evil of dislike and disrepute upon him who has committed them, that is, every false imputation, shall be punished at least by reparation to be made to the party injured; the term *evil* is to this purpose perfectly precise. It would remain with the complainant to show what kind and degree of injury he had received; which is a matter of fact, to be estimated, in each instance, from the evidence adduced, by the tribunal before which the question is brought. If the injury sustained is a pecuniary injury, the question coincides exactly with the question of damages, decided regularly, in English courts, as a question of fact, by the jury.

Injuries of the kind which we are now considering can affect a man only in two ways; either by lessening the pecuniary value which he might otherwise have enjoyed, or by lessening the marks of respect and affection which he would otherwise have received. What the loss is, in this latter instance, is also evidently a question of fact. It has nothing, therefore, to do with the legal definition of the offence, the business of the legislature. It is a question, which, like other questions of fact, must of necessity be determined upon evidence by the tribunal before which it is brought. It is no doubt a question of delicacy, and considerable difficulty, because the evidence must often consist of very fine and minute circumstances, which can seldom be precisely ascertained. But this is not the only class of judicial questions, the determination of which depends upon such evidence as it is very difficult accurately to collect and to weigh. What is of greatest importance, on this occasion, to remark, is, that all the difficulty lies in the matter of fact. There is no doubt or obscurity in the law, which says, that whatsoever hurt a man has sustained through actions or dispositions falsely imputed to him, he shall receive compensation for. Difficulties, however, arising either from the complexity of the matter of fact, or the obscurity of the evidence, no legislative enactments can prevent. These are confided to the skill and integrity of the judge.

The compensation which ought to be made to a man for the diminution of those marks of respect and affection which he would otherwise have received, is a question for

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n which it ought to be treated, the developments presented in the article Jurisprudence are understood to be present to the mind of the reader; if they are not, the very brief exposition here given will not be understood.

the legislature. Let us suppose that a soldier has been accused of cowardice, in such a manner as to create a general belief of the truth of the accusation; that a man of honour has been accused of mendacity, or of some of those irregular propensities to which the horror of the public is attached; it is evident that money is not, in such cases, an appropriate compensation.

When a man, through the offence of another, has been deprived of a certain amount of money, or of money's worth, we say that he has received compensation, when he is placed in the same situation in which he would have been if the offence had never taken place.

According to this idea of compensation, a man, against whom an unfavourable opinion has been created by the act of another man, has received compensation, when he is placed in the same situation with regard to the opinion of those with whom he is connected, as if that act had not taken place. This, therefore, is the object which it ought to be the endeavour of the legislature to effect.

One expedient is perfectly appropriate. It is, that the man who has falsely propagated an unfavourable opinion with respect to another, should be made to do whatever is in his power to remove the impression he has made. To this end, he should publish the sentence of the judge, declaring that the action or disposition which he had imputed to the individual injured, he had imputed to him falsely. He should at least be made to publish it in every way in which he had published the imputation. Frequently a more extensive publication might be required.

In some cases, it will be allowed, that thus much would suffice. It may, however, be affirmed, that often the impression would be too profoundly struck, to be effaced by a mere knowledge of the sentence of the judge. In such cases, something more in the way of compensation would be required. On this, it is of importance to be observed, that if the impression produced by an imputation, which, after solemn inquiry, the judge has declared to be false, should not, by that declaration, be completely effaced, it implies necessarily one of two things; either that the public have evidence of the truth of the accusation, which was not adduced to the judge, and then the remaining impression is not owing to the imputation which the judge has condemned, but to the evidence; or, secondly, that the public mind is in a state of gross ignorance and imbecility, capable of forming opinions, even on the clearest subjects, not only not according to evidence, but in opposition to it. If the public mind, however, is in such a deplorable condition, it is the fault of the legislature; and for the rectification of this evil, the best course undoubtedly is, to take effectual measures for the instruction of the people, which instruction would soon place them beyond the danger of such delusions. In the mean time, if something more than the publication of the sentence of the judge were necessary to restore a man to that degree of consideration, of which the false imputation had deprived him, governments have numerous ways of raising the consequence of individuals; and no legislature would be at a loss for a gradation of expedients suited to the scale of demand.

Means which should be used for preventing the Violation of Rights by the Press.

We have now illustrated that part of this question which regards compensation to the injured individual. It remains to inquire what is best to be done in this case, for the attainment of the other object of punishment, namely, the prevention of similar offences in time to come.

To devise a punishment sufficient to prevent an offence, is to provide a motive sufficient to counteract the motive which leads to the offence. We have hence to consider what are the motives by which men are incited to make false imputations on the characters of others.

These motives may be of three different sorts. A man may derive *pecuniary profit*, he may derive *comparative distinction*, or he may satisfy his desire of *vengeance* by blackening the character of his neighbour.

In the case in which a man has by calumny wrongfully intercepted the pecuniary receipts of his neighbour, the obligation of making satisfaction to the party injured would, it is obvious, alone suffice, provided the machinery of the laws were sufficiently perfect to render the execution of them certain. Seldom would any man calumniate his neighbour for the sake of placing L.20 in his own pocket, if he were sure that, next day, or next week, he would have to restore it, with all the profit which might have been made by the use of it, and with the disgrace besides of having committed an action which other men abhor.

Sometimes, however, a man may derive pecuniary profit from calumniating persons whom he has not by that means deprived of any pecuniary advantage; by the sale, for example, of a slanderous publication; when the satisfaction due to the individual may not be of a nature to counteract the motive which leads to the offence. The expedient in this case, also, is sufficiently obvious, and sufficiently simple. It is necessary to ascertain the whole of the gain which has been made by the offender, and to take it away from him. This, together with the satisfaction which he ought to make to the injured individual, would, if it were certain, create a surplus of motive to abstain from the injurious act.

In both of these cases, if the execution of the law is uncertain, an additional punishment may be necessary, sufficient to compensate for the chance of escape. The allowance to be made on this score must depend upon the imperfection of the laws; while one important fact is to be kept in remembrance, that as severity of punishment, beyond a certain point, is increased, certainty of execution is diminished. The true expedient, therefore, is to render the machinery of the laws so perfect, that the penalties which they denounce may always be sure of execution; and then hardly any thing beyond compensation to the individual, and the abstraction of any additional gain which might have been made by the propagation of slander, would be necessary to repress all offences against the reputation of others, to which the motive was constituted by pecuniary gain.

The two remaining cases are still more simple. If a man propagates a falsehood, for the sake of injuring the character of a man by whom his own consideration is eclipsed, it is only when he expects to obtain by that means a permanent advantage. If he knows that immediately the law will take its hold upon him; that he will be compelled to re-elevate the character of his neighbour, and to proclaim his own disgrace, he will see that, to attempt depressing the character of another man by calumny, is the very worst of all expedients for giving a comparative elevation to his own. The same is the result in the case where vengeance constitutes the motive to injure the reputation of another. To render this proposition manifest, the most obvious illustration will suffice. No man, to gratify his malignity to another person, would kill his ox or his ass, provided he were sure that immediately he would be obliged to make him full satisfaction; and instead of injuring the man whom he hated, to injure only himself. No, the rudeness and inefficacy of the law, holding out a chance of escaping the duty of making reparation, is the sole origin and cause of all offences of this description; and if the law were placed in a state but approaching to perfection, hardly any thing beside the obligation of making satisfaction would be necessary to repress the whole of this order of crimes.

Whether any Imputation by which Truth is not violated, should be considered an Offence by the Press.

We have now made considerable progress in this important inquiry. We have ascertained, we think, with sufficient evidence, all that is necessary to be done for preventing injuries to the reputation of individuals; provided the rights of reputation are not, by the civil code, made to extend beyond the boundaries of truth. Whether or not they ought to extend farther, and individuals ought to be protected from the disclosure of acts which they may have committed, is, we confess, a question highly worthy of solution; upon which, therefore, before we proceed to any of the subsequent topics, we shall offer the following reflections.

There can be no doubt that the feelings of the individual may be as painful, where actions of a disreputable nature are truly, as where they are falsely, imputed to him. It is equally certain, that no painful feelings ought to be wilfully excited in any man, where no good, sufficient to overbalance that evil, is its natural consequence.

We have already shown, that reputation is injured by the imputation of acts of two different descriptions; first, those to which the law annexes penalties; secondly, those to which disrepute and the dislike of others are annexed.

With respect to those acts to which the law annexes penalties, there is no room for uncertainty or dispute. Unless the law is a bad law, which ought to be repealed (this, we confess, constitutes an exception, and one which, in very imperfect codes, extends a great way), the law ought not to be disappointed of its execution. The man who gives information against a murderer, or a thief, by the press, or without the press, renders a public service, and deserves not punishment, but reward.

It appears, therefore, that the question, whether a man ought to be protected from the imputation of actions which he has really committed, refers solely to those acts which, without being punishable by the law, are attended with disrepute; acts, in other words, which the members of the society disapprove and dislike.

The prospect of the immediate and public exposure of all acts of this description, would be a most effectual expedient to prevent their being committed. Men would obtain the habit of abstaining from them, and would feel it as little painful to abstain, as at present it is to any well educated person to keep from theft, or those acts which constitute the ill manners of the vulgar. The fable of Momus has always been understood to carry an important moral. He found grievous fault that a window had not been placed in the breast of every man, by which, not his actions alone, but his thoughts, might have been known. The magnanimity of that Roman has been highly applauded, who not only placed his residence in such a situation that his fellow-citizens might see as much as possible of his actions, but declared a wish that he could open to all eyes his breast as well as his house.

If the hatred and contempt of the people, therefore, were always rightly directed, and rightly proportioned,—if they never operated against any actions but those which were hurtful, either to the individual himself, or to others, and never, but in the degree in which they were hurtful,—the case would be clear; the advantage which would be derived from the true exposure of any man's actions of any sort, would exceed beyond calculation the attendant evil. The great difficulty of insuring the practice of morality, in those numerous and highly important cases to which the legal sanction, or the *security of pains and penalties*, does not extend, consists in the want of a motive always present, and powerful enough to counteract the instant motive which urges to the instant offence. That motive almost every man would derive from the knowledge that he had the eyes upon him of all those the good opinion of whom it was his interest to preserve; that no immoral act of his would escape their observation, and a proportionate share of their hatred and contempt. It is in this view that the aid of religion has been sometimes regarded as of importance to morality, suggesting the idea of a high and constant observer. All motives, however, are feeble, in proportion as the pains and pleasures upon which they depend are distant, vague, or uncertain. Divines agree with all other men in complaining of the trifling effect of religious motives upon the lives of the greater number of men. From the nature of the prospect on which these motives depend, they could not be less feeble than they have been thus described. The case is not the same with the motives arising from the sentiments which we know we shall inspire in the breasts of our fellow-creatures. It is a matter of daily and incontrovertible experience, that these are among the most powerful which operate upon the human mind. The soldier rushes upon death, and endures all the hardships and toils of his cruel profession, that he may enjoy the admiration and escape the contempt of his fellow-men. On what else is founded the greater part of all human pursuits? How few, even of those who toil at the meanest occupations, but exert themselves to have something for show, something to make an impression upon the eyes of those who surround them? The very subject of the present inquiry derives from this source the whole of its importance. The value of reputation is, indeed, but another name for the value which we attach to the favourable and unfavourable sentiments of our fellow-men.

It is, however, true, that their unfavourable sentiments do not always fall where they ought; and this, we confess, is a consideration of the highest importance. It very often happens that men's antipathies are excited to actions from which no evil ensues, either to him who performs them, or to any body else. If any man derives a pleasure from such actions, it is to limit his sphere of innocent enjoyment to debar him from them. And if the press exposes him to the antipathies, the hatred, and contempt of his fellow-creatures, on account of those actions, it produces an evil, uncompensated by the smallest portion of good. To an Indian Brahmin, if he were known to have eaten, even when starving, a morsel of food which had been prepared by a Christian, the consequences would be dreadful. Where the Roman Catholic religion is in vigour, a man who should indulge himself in animal food on forbidden days would be regarded with horror. The use of wine, however moderate, would render a Mahommedan execrable to the whole of his tribe.

This misdirection of the favourable and unfavourable sentiments of mankind; in other words, this perversion and corruption of their moral sentiments, has, in by far the greater number of instances, been the work of priests, contriving the means of increasing their influence. In some very important instances, such, for example, as the prejudices of birth, at one time in Europe so powerful as to make men of low birth objects of the greatest contempt, men of elevated birth objects of the highest veneration, the perversion of the moral sentiments is evidently the work of the aristocratical class, securing to themselves a more easy dominion over the rest of their fellow-creatures.

It is, therefore, evident, that where antipathies, religious or aristocratical, should prevail, the press would be hurtfully employed in giving notoriety to the facts which would expose a man to the operation of either.

We have now ascertained the cases in which it would *not* be good that men should be protected from the declaration of truth by the press, and also the cases in which it *would* be good that they should be so protected.

What, upon this view of the subject, would be desirable, is sufficiently clear. It would be desirable that, in the one set of cases, the declaration should be allowed, in the other it should not be allowed. Are the two sets of cases, however, capable of being accurately distinguished?

If the comparison is made with any attention, it will not be difficult to determine that the evil to be incurred by the loss of truth in the set of cases in which the declaration of it would be useful, is much greater than that which would arise from permitting the declaration in the cases in which it would be hurtful.

In the first place, the set of cases in which the declaration would be useful are much more numerous, and much more important, than those in which, in any tolerably civilized state of society, it would be hurtful. Those in which it would be useful embrace the whole field of morality, all those acts, the performance of which, on account of their singular importance, has been elevated to the rank of virtues. Every body believes and proclaims, that the universal practice of the moral virtues would insure the highest measure of human happiness; no one doubts that the misery which, to so deplorable a degree, overspreads the globe, while men injure men, and, instead of helping and benefiting, supplant, defraud, mislead, pillage, and oppress one another, would thus be nearly exterminated, and something better than the dreams of the golden age would be realized upon earth. Toward the attainment of this most desirable state of things, nothing in the world is capable of contributing so much as the full exercise of truth upon all immoral actions, that is, all actions, the practice of which is calculated to lessen the amount of human happiness. According to this view, the justice of which it is impossible to dispute, the evil incurred by forbidding the declaration of truth upon all immoral actions is incalculable. That which would be incurred by the antipathies of misguided minds against actions innocent in themselves, nobody, we should imagine, would so much as think of placing in comparison.

In our own country, for example, the classes of actions which, though they injure nobody, expose a man to the unfavourable sentiments of others, are not numerous. The number of persons who would be exposed to inconvenience on account of the declaration of truth in regard to them, would be small in comparison with those who would benefit by its declaration in the case of all really hurtful acts.

It is, indeed, important to be observed, that a comparative smallness of number is necessarily implied in the supposition of injury from any unfounded antipathy. Those who share in the antipathy, of course, abstain from the action. And unless the antipathy were so general as to include almost the whole of the society, it would lose its injurious effect. Besides, all the injury which can be done to the individuals against whom truth would in this manner operate injuriously, would be, to make them abstain from the acts which were thus condemned.

Another thing to be considered is, that the whole of the evil arising from the exercise of truth is dependent upon an accidental circumstance, capable of being removed; upon a mental disease, requiring to be cured, which the legislature ought to be constantly endeavouring to cure, and toward the cure of which truth is likely to operate as the most effectual of all expedients. If any considerable inconvenience were experienced from exposure to unfounded antipathies, in consequence of the publication of truth, the groundlessness of these antipathies could not fail in this case to be so often canvassed, and made to appear, that at last it would become familiar to the multitude, and the antipathies would expire.

It clearly, therefore, appears, that, if the cases in which the declaration of truth would expose to unfounded prejudices could not be clearly defined, and separated from the cases in which the declaration would be salutary, the rule of permitting truth ought to be universal. But, though we perceive, that, to a considerable extent, there are cases, in respect to which it would be vain to hope for agreement in drawing the line of distinction between what is hurtful and what is not, we are persuaded that principles might be laid down in which all would agree, and which would serve to mark out certain cases for exception with sufficient exactness. If any such cases could be separated, either of actions, which, though injurious to nobody, excited antipathies, or of facts, as those of birth, for which, though a man was in no respect worse, he might be regarded as worse; the exercise of truth, with regard to them, might, on the express ground that they were actions innoxious, or facts which ought to be of no importance in the estimate of human worth, be forbidden, when injurious, under the penalty of at least making reparation for all the injury of which it had been the cause.

III.—OFFENCES OF THE PRESS WITH RESPECT TO GOVERNMENT.

We have now explained, we trust with sufficient clearness for the present occasion, the principles upon which laws should be constructed for protecting the *rights of individuals* against violations committed by the press. The first part of this inquiry, therefore, we must consider as completed. In the second part we have to explain the principles upon which they should be constructed for protecting *the operations of government.*

Exhortations to obstruct the Operations of Government in detail should, Exhortations to resist all the Powers of Government at once should not, be considered Offences.

Unless a door is left open to resistance of the government, in the largest sense of the word, the doctrine of passive obedience is adopted; and the consequence is, the universal prevalence of misgovernment, insuring the misery and degradation of the people. On the other hand, unless the operations of government, instituted for the protection of rights, are secured from obstruction, the security of rights, and all the advantages dependent upon the existence of government, are at an end. Between these two securities, both necessary to obtain the benefits of good government, there appears to be such a contrariety, that the one can only be obtained by the sacrifice of the other.

As this difficulty, however, arises chiefly from the extent of the terms, a close inspection of the cases which they involve, and which they have a tendency to confuse, will enable us to discover the course which it belongs to practical wisdom to pursue.

It is necessary, first of all, to ascertain what sort of obstructions are inconsistent, and what are not inconsistent, with those operations of government which are necessary for the protection of rights.

The application of physical force to resist the government in applying to the execution of the laws the physical power placed at its disposal by the law, is such an obstruction of the operations of government, as would, if frequent, render it inadequate to the ends which it is provided to secure. This application of force, therefore, must be treated as an offence; and any thing proceeding from the press, tending directly to produce it, as a similar offence.

This proposition requires to be illustrated. The application of physical force which is here described, and treated as an evil, is clearly distinguishable from that resistance of government which is the last security of the many against the misconduct of the few. This is an application of physical force to obstruct the operations of government in detail; the proceedings, for example, of a court of justice; the proceedings of the legislative organ, or the proceedings of any of the administrative functionaries, in the execution of the duties with which they are charged. This is not that species of resistance which is necessary, in the last resort, to secure the people against the abuse of the powers of government. This last is not a resistance to the operations of government in detail. It is a resistance to all the powers of government at once, either to withdraw them from the hands in which they have hitherto been deposited, or greatly to modify the terms upon which they are held.

Even this last species of resistance it may be necessary to punish, at least in a certain degree, whenever it is not successful; that society may not be disturbed by commotions which the majority of the people disapprove. This, however, is a question which belongs to the penal code in general, and does not concern the inquiry into the offences capable of being committed by the press; because we think it may be satisfactorily shown, that no operation of the press, however directly exhorting to this species of resistance, ought to be treated as an offence.

The reason is, that no such exhortation can have any immediate or formidable effect; can, indeed, have any effect at all, except through such mediums as ought to be at all times perfectly free. Suppose that a work is published, exhorting the people in general to take arms against the government, for the purpose of altering it against the consent of its rulers. The people cannot take arms against the government without the certainty of being immediately crushed, unless there has been already created a general consent. If this consent exists in such perfection as to want nothing to begin action but an exhortation, nothing can prevent the exhortation; and forbidding it is useless. If the consent does not exist in nearly the last degree of perfection, a mere exhortation, read in print, can have no effect which is worth regarding. In all circumstances, therefore, it is useless, and consequently absurd, to treat this species of exhortation as an offence. If, on the other hand, it were clearly recognised, that every man had a license to exhort the people to the general resistance of the government, all such exhortations would become ridiculous, unless on those rare and extreme occasions on which no prohibitions and no penalties can or ought to prevent them. The doctrine of this paragraph, which will appear somewhat startling and paradoxical to minds accustomed only to a certain train of ideas, will receive illustration, and we trust will be amply confirmed, as we proceed.

Having mentioned this as a grand exception, we now return to the cases in which not only physical force applied to obstruct the operations of government, but the publishing of exhortations to that obstruction, ought to be treated as an offence. These relate solely, as above remarked, to the operations of government in detail. Obstructions, it is evident, may be offered to the operations in detail of a government which possesses and deserves the fullest confidence of the community at large; and the press may be employed in directly and efficiently exciting to these obstructions. A hand-bill, for example, distributed at a critical moment, and operating upon an inflamed state of mind, in a narrow district, may excite a mob to disturb the proceedings of a court of justice, to obstruct public officers in the execution of their duties, or even to disturb, on this or that occasion, the deliberations of the legislature itself.

These are clearly hurtful acts; they may be very accurately defined; and penalties, of moderate severity, would be sufficient to deter from the performance of them. Satisfaction by the party offending to the party injured, would often, in offences of this description, be out of the question; because there would be no definite party to whom an injury would be occasioned. It would only be necessary to ascertain the sorts of motives by which such offences would be liable to be produced, and to apply skilfully, as in other cases, motives of an opposite tendency, sufficient to counteract them. This would not be more difficult in this than in other cases, and it is not, therefore, necessary to explain at any length the mode of performing it.

One principle is to be carefully and most religiously observed, that of not imposing an atom of punishment for the purposes of *vengeance*. This is a principle, the justness and importance of which are so completely recognised, that we might have expected to be relieved ere now from the necessity of recommending attention to it. The fact, however, is, that so long as there are abuses in governments, so long will the men, who have the means of profiting by those abuses, exert themselves to multiply the list of offences against government, and to apply to them punishments of the greatest severity.

Punishments for contempt of court; punishments to vindicate the honour of the court, of the government, of the magistracy; punishments for the support of dignity; punishments severe in proportion as the dignity of the party offended is supposed to be high, and so on, are punishments almost always applied for purposes of vengeance, or the protection of the instruments of abuse. They are punishments, therefore, which will be rigidly excluded from a code which wisely and steadily pursues the general good.

Of Exhortations to obstruct the Operations of Government in detail, there are two Sorts: 1. The Direct; 2. The Implied, or Constructive.

What the *sort of acts* are, to which the exhortations of the press ought not to be applied, has been so far ascertained. The next point is, to determine with accuracy what *sort of exhortation* it is that ought to be forbidden.

To all those who profit by the abuses of government, that is, more especially, to all those who, in a defective government, wield any of its powers, it is of great importance to leave as undefined as possible the sort of exhortation that ought to be forbidden. The point of greatest importance to them is, to keep the people at large from complaining, or from knowing or thinking that they have any ground of complaint. If this object is fully attained, they may then, without anxiety, and without trouble, riot in the pleasures of misrule: there is no limit to the degree in which the few may pursue their own advantage at the expense of the many.

There can be nothing, therefore, in which they have a greater interest, than preventing the press from being employed in any such way as will lead the people to think that they have any thing, on the part of their rulers, of which to complain. All artifices possible will be sure to be employed to effect that prevention. And if it is enacted, that exhortations to acts which obstruct the operations of government in detail should be punished, *without defining accurately what sort of exhortations*, they will easily find expedients; which will, to a great extent, accomplish their purpose.

Under the sort of constructions which it will be their interest to apply, every thing which can be done by the press to make the people know or believe that there is any thing in the system of their government, or the conduct of their rulers, of which they have to complain, may be treated as an exhortation to obstruct the operations of government. Of these constructions our experience affords innumerable examples. Does not the imputing of defects to the government, or misconduct to those who wield the powers of government, tend to bring both " into hatred and contempt?" And if the people hate and contemn the institutions and rulers of their country, will they not oppose their operations? The imputing of these faults, therefore, is it not, in essence and effect, an exhortation to oppose the operations of government? And are we to be governed, in our legislature, by the mere forms in which a set of words may appear, and not by our knowledge of their nature and consequences?

This is not only exceedingly plausible, but almost all the propositions which it involves are true. It is thus, therefore, the more easy to establish such a mode of interpreting an indefinite law of the press, as will prevent, or, where the people cannot yet bear a total prevention, will go far towards preventing, whatever can lead the people to believe that any thing is amiss in the manner in which they are ruled.

There are two species of exhortations, the one explicit and direct, the other implied and constructive. In the one, a particular act is pointed out, and the party or parties addressed are called upon to perform it. In the other, certain grounds are only laid, from which the opinion of the addresser, that the act ought to be performed, may, with more or less certainty, be inferred.

With respect to the first, there is no occasion for doubt. A direct and explicit exhortation to commit one of those acts, described above as obstructing the operations of government in detail, should be treated as an offence. The precise question is, whether any exhortation, which is only implied and constructive, should be considered an offence? In the answer to this question, almost every thing which relates to the use of the press in matters of government will be found to be involved.

Exhortations which are Implied and Constructive, ought not to be punished.

We have already divided the subject of resistance to government into two parts; first, that general resistance, the object of which is some great change in the government at large; and, secondly, resistance to this or that of its operations in detail.

We have already adduced an argument, which appears to us to be conclusive, to show that no exhortation, whether explicit or implied, direct or indirect, the object or tendency of which is to produce the first species of resistance, ought to be subject to legal restraint.

It is necessary here to enter a little more fully into the grounds of that opinion.

We think it will appear, with sufficient evidence, that, in the way of indirect exhortation to resistance, that is, in laying the grounds of dissatisfaction with the government, there is no medium between allowing every thing and allowing nothing; that the end, in short, which is sought to be gained, by allowing any thing to be published in censure of the government, cannot be obtained, without leaving it perfectly free to publish every thing.

The end which is sought to be obtained by allowing any thing to be said in censure of the government, is, to censure the goodness of the government; the most important of all the objects to the attainment of which the wisdom of man can be applied. If the goodness of government could be insured by any preferable means, it is evident that all censure of the government ought to be prohibited. All discontent with the government is only good, in so far as it is a means of removing real cause of discontent. If there is no cause, or if there is better means of removing the cause, the discontent is, of course, an evil, and that which produces it an evil.

So true it is, however, that the discontent of the people is the only means of removing the defects of vicious governments, that the freedom of the press, the main instrument of creating discontent, is, in all civilized countries, among all but the advocates of misgovernment, regarded as an indispensable security, and the greatest safeguard of the interests of mankind.

For what is meant by a vicious government? or wherein do the defects of government consist? Most assuredly they all consist in sacrificing the interests of the many to the interests of the few. The small number, in whose hands the powers of government are, in part directly, in part indirectly, placed, cannot fail, like other men, to have a greater regard for what is advantageous to themselves, than what is advantageous to other men. They pursue, therefore, their own advantage, in preference to that of the rest of the community. That is enough. Where there is nothing to check that propensity, all the evils of misgovernment, that is, in one word, the very worst evils by which human nature is afflicted, are the inevitable consequence. (See the article GOVERNMENT.)

There can be no adequate check without the freedom of the press. The evidence of this is irresistible. In all countries, the people either have a power legally and peaceably of removing their governors, or they have not that power. If they have not that power, they can only obtain any considerable ameliorations of their governments by resistance, by applying physical force to their rulers, or, at least, by threats so likely to be followed by performance, as may frighten their rulers into compliance. But resistance, to have this effect, must be general. To be general, it must spring from a general conformity of opinion, and a general knowledge of that conformity. How is this effect to be produced, but by some means, fully enjoyed by the people, of communicating their sentiments to one another? Unless where the people can all meet in general assembly, there is no other means of attaining this object, to be compared with the freedom of the press.

It is, no doubt, true, that in countries where the liberty of the press is unknown, bad governments are frequently overthrown. This is almost always accomplished by the military force, revenging some grievance of their own, or falling in with some heat and animosity of the people. But does it ever enable them to make a new government, in which any greater security is provided for their interests than there was before? In such cases, the people get rid of one set of rulers, whom they hate, only to obtain another set, with equal powers of doing them injury.

There are, however, we believe, some people who say, that though the liberty of the press is a necessary instrument to attain good government, yet, if it is fairly attained, and if legal and peaceable means are in the hands of the people of removing their governors for misconduct; if the people of England, for example, really chose the members of the House of Commons, and renewed their choice so frequently, as to have the power of removal after a short experience of misconduct; the freedom of the press would be unnecessary.

So far is this from being true, that it is doubtful whether a power in the people of choosing their own rulers, without the liberty of the press, would be an advantage.

Freedom of Censure on the Conduct of their Rulers, is necessary for the good of the People.

It is perfectly clear that all chance of advantage to the people, from having the choice of their rulers, depends upon their making a good choice. If they make a bad choice, if they elect people either incapable, or disinclined, to use well the power intrusted to them, they incur the same evils to which they are doomed when they are deprived of the due control over those by whom their affairs are administered.

We may then ask, if there are any possible means by which the people can make a good choice, besides the *liberty of the press?* The very foundation of a good choice is knowledge. The fuller and more perfect the knowledge, the better the chance, where all sinister interest is absent, of a good choice. How can the people receive the most perfect knowledge relative to the characters of those who present themselves to their choice, but by information conveyed freely, and without reserve, from one to another?

There is another use of the freedom of the press, no less deserving the most profound attention, that of making known the conduct of the individuals who have been chosen. This latter service is of so much importance, that upon it the whole value of the former depends.

This is capable of being rigidly demonstrated. No benefit is obtained by making choice of a man who is well qualified to serve the people, and also well inclined to serve them, if you place him in a situation in which he will have preponderant motives to serve himself at their expense.

If any set of men are chosen to wield the powers of government, while the people have not the means of knowing in what manner they discharge their duties, they will have the means of serving themselves at the expense of the people; and all the miseries of evil government are the certain consequence.

Suppose the people to choose the members of the legislative assembly, with power of rechoosing or dismissing them at short intervals; to what desirable end could these powers be exercised, without the liberty of the press? Suppose that any one of those whom they have chosen has misconducted himself, or promoted, as far as depended upon him, the ends of misgovernment, how are the people to know that the powers with which they had intrusted him had been treacherously employed?

If they do not know, they will rechoose him, and that as cordially as the man who has served them with the greatest fidelity. This they are under a deplorable necessity of doing, even to be just; for, as they know no difference between him and the best, it would be on their part iniquity to make any. The consequences would be fatal. If one man saw that he might promote misrule for his own advantage, so would another; so of course would they all. In these circumstances we see laid the foundation on which, in every country, bad government is reared. On this foundation it is impossible that it should not be reared. When the causes are the same, who can expect that the effects will be different? It is unnecessary to dwell upon these fundamental truths, because they have already been developed in the article Government.

Without the knowledge, then, of what is done by their representatives, in the use of the powers intrusted to them, the people cannot profit by the power of choosing them, and the advantages of good government are unattainable. It will not surely cost many words to satisfy all classes of readers, that, without the free and unrestrained use of the press, the requisite knowledge cannot be obtained.

That an accurate report of what is done by each of the representatives, a transcript of his speeches, and a statement of his propositions and votes, is necessary to be laid before the people, to enable them to judge of his conduct, nobody, we presume, will deny. This requires the use of the cheapest means of communication, and, we add, the free use of those means. Unless every man has the liberty of publishing the proceedings of the legislative assembly, the people can have no security that they are fairly published. If it is in the power of their rulers to permit one person, and forbid another, the people may be sure that a false report, that is, a report calculated to make them believe that they are well governed when they are ill governed, will be often presented to them.

Liberty of the Press.

One thing more is necessary, and so necessary, that if it is wanting, the other might as well be wanting also. The publication of the proceedings tells what is done. This, however, is useless, unless a correct judgment is passed upon what is done.

We have brought this inquiry, then, to an important point. In the article Government, we have seen that, unless the people hold in their own hands an effectual power of control on the acts of their government, the government will be inevitably vicious. We have now seen that they cannot exercise this control to any beneficial purpose, without the means of forming a correct judgment upon the conduct of their representatives. We have likewise seen, that one of the means necessary to enable them to judge correctly of the conduct of their representatives, is the liberty to every body of publishing reports of what they do. It remains to inquire by what other acts the press can be made to contribute to the same desirable end.

What is wanted is, that all the people, or as many of them as possible, should estimate correctly the consequences of the acts proposed or done by their representatives, and also that they should know what acts might have been proposed, if the best were not proposed, from which better consequences would have followed. This end would be accomplished most effectually, if those who are sufficiently enlightened would point out to those who are in danger of mistakes, the true conclusions; and, showing the weight of evidence to be in their favour, should obtain for them the universal assent.

How is this to be accomplished? In what manner are those wise men to be chosen? And who are to be the choosers? Directly the object cannot be attained. There are no distinct and indubitable marks by which wisdom, and less by which integrity, is to be known. And who is to be trusted with the privilege of pointing them out? They whose judgment requires to be directed are not well qualified to determine who shall direct them. And if the rulers are to choose, they will employ none but those who will act in conformity to their views, and enable them to benefit themselves by the pillage and oppression of the people.

As there is no possible organ of choice, no choice whatever ought to be made. If no choice is to be made, every man that pleases ought to be allowed. All this is indubitable. The consequences of denying any part of it are so obvious, that hardly any man, we suppose, will risk the imputations to which such a denial would justly expose him.

They who say that no choice ought to be made, say, in effect, that no limit whatsoever ought to be imposed upon the liberty of the press. The one of these propositions is involved in the other. To impose any restraint upon the liberty of the press, is undoubtedly to make a choice. If the restraint is imposed by the government, it is the government that chooses the directors of the public mind. If any government chooses the directors of the public mind, that government is despotic.

Suppose that, by the restraint imposed upon the liberty of the press, all censure of the government is forbidden; here is undoubtedly a choice. The government, in this case, virtually says, the people who might attempt the task of directing the public mind are of two sorts; one, those who would censure; another, those who would not censure; I choose the latter.

Suppose that not every censure, but only such and such kinds of censure, are forbidden; here, again, is still a choice, while confessedly there is no party to whom the power of choosing for the rest can with safety be given.

If not every censure, but only some censures, are to be forbidden, what are those to which the prohibition should extend? The answer to this question will elucidate nearly all that yet remains in any degree obscure, of the doctrine of the liberty of the press.

It will not be said that any censure which is just should be forbidden, because that would undoubtedly be to detract from the means of enabling the people to form correct judgments; and we have, we trust, rendered it indisputable that no source of benefit to society is at all to be compared with that of correct judgments, on their government and its functionaries, formed by the people, and determining their actions.

But what censures are just and what are unjust; in other words, what are the conclusions which ought to be formed respecting the properties and the acts of the government, is exactly the point to be determined. If you say that no man is to pass an unjust censure upon the government, who is to judge? It is surely unnecessary to repeat the proof of the proposition, that there is nobody who can safely be permitted to judge. The path of practical wisdom is as clear as day: all censures must be permitted equally, just and unjust.

Where various conclusions are formed among a number of men, upon a subject on which it would be unsafe, and therefore improper, to give any minor portion of them a power of determining for the rest, only one expedient remains. Fortunately, that is an expedient, the operation of which is powerful, and its effects beneficial in the highest degree. All the conclusions which have formed themselves in the minds of different individuals should be openly adduced, and the power of comparison and choice should be granted to all. Where there is no motive to attach a man to error, it is natural to him to embrace the truth; especially if pains are taken to adapt the explanation to his capacity. Every man possessed of reason is accustomed to weigh evidence, and to be guided and determined by its preponderance. When various conclusions are, with their evidence, presented with equal care and with equal skill, there is a moral certainty, though some few may be misguided, that the greater number will judge right, and that the greatest force of evidence, wherever it is, will produce the greatest impression.

As this is a proposition upon which every thing depends, it is happy that the evidence of it should be so very clear and striking. There is, indeed, hardly any law of human nature more generally recognised, wherever there is not a motive to deny its existence. "To the position of Tully, that if Virtue could be seen, she must be loved, may be added," says Dr Johnson, "that if Truth could be heard, she must be obeyed." (*Rambler*, No. 87.) "Je vous plains, mes Pères," says M. Pascal to the Jesuits, "d'avoir recours à de tels remèdes. Vous croyez avoir la force et l'impunité: mais je crois avoir la vérité, et l'innocence. C'est une étrange et longue guerre que celle où la violence essaie d'opprimer la vérité. Tous les efforts de la violence ne peuvent affoiblir la vérité, et ne servent qu'à la relever davantage: toutes les lumières de la vérité ne peuvent rien pour arrêter la violence, et ne font que l'irriter encore plus. Quand la force combat la force, la plus puissante détruit la moindre: quand l'on expose les discours aux discours, ceux qui sont véritables et convainquants confondent et dissipent ceux qui n'ont que la vanité et le mensonge." (*Lettres Provinciales*, 12.)—"Reason," says Burke, "clearly and manfully delivered, has in itself a mighty force; but reason, in the mouth of legal authority, is, I may fairly say, irresistible." (*Letter on a Regicide Peace.*)

It is of importance to show how many of the greatest men, of all ages and countries, have borne testimony to the prevalence of true over false conclusions, when both are fairly offered to the human mind. "Truth," says Mr Locke, "certainly would do well enough, if she were once left to shift for herself. She seldom has received, and I fear never will receive, much assistance from the power of great men, to whom she is but rarely known, and more rarely welcome. She is not taught by laws, nor has she any need of force to procure her entrance into the minds of men." (*Letter on Toleration.*) The following is the emphatical language of Montesquieu: "La raison a un empire naturel; elle a même un empire tyrannique: on lui resiste, mais cette resistance est son triomphe, encore un peu de temps, et l'on sera forcé de revenir à elle." (*Esprit de Loix*, l. xxviii. ch. 38.) "It is noted out of Cicero, by Machiavel, that the people, though they are not so prone to find out truth of themselves, as to follow custom, or run into error, yet if they be shown truth, they not only acknowledge and embrace it very suddenly, but are the most constant and faithful guardians and conservators of it." (*Harrington.*) "The labour of a confutation," says Chillingworth, "I have not in any place found such labour or difficulty, but that it was undertakeable by a man of very mean abilities; and the reason is, because it is *Truth* I plead for; which is so strong an argument for itself, that it needs only light to discover it." (*Religion of Protestants.*) "About things on which the public thinks long," says Dr Johnson, "it commonly attains to think right." (*Life of Addison.*) "The adversary," says Dr Campbell, "is both subtile and powerful. With such an adversary, I should on very unequal terms enter the lists, had I not the advantage of being on the side of truth. And an eminent advantage this doubtless is. It requires but moderate abilities to speak in defence of a good cause. A good cause demands but a distinct exposition, and a fair hearing; and we may say, with great propriety, it will speak for itself." (Campbell *on Miracles*, Introd.)

We have, then, arrived at the following important conclusions, viz. that there is no safety to the people in allowing any body to choose opinions for them; that there are no marks by which it can be decided beforehand, what opinions are true and what are false; that there must, therefore, be equal freedom of declaring all opinions, both true and false; and that, when all opinions, true and false, are equally declared, the assent of the greater number, when their interests are not opposed to them, may always be expected to be given to the true. These principles, the foundation of which appears to be impregnable, suffice for the speedy determination of every practical question.

All censure thrown upon the government, all censure thrown either upon the institutions of the government, or upon the conduct of any of the functionaries of government, supreme or subordinate, has a tendency to produce resistance to the government.

Of the censures thrown upon government, some may have a tendency to produce resistance to the operations of government in detail; others that general resistance which has in view some great alteration in the government.

Of the first sort would be any such accusation of the conduct and disposition of a judge, as might excite the people, whose sympathies were roused in favour of the individual against whom his sentence was to operate, to rescue him from the officers of justice. We have already shown that such a rescue ought to be punished, and any direct exhortation to it ought to be punished. It will now be evident, we trust, that no censure on the judge, though capable of being treated as an indirect exhortation, ought to be punished.

The reason is conclusive. The people ought to know, if possible, the real qualities of the actions of those who are intrusted with any share in the management of their affairs. This they have no chance of knowing, without the of unlimited power of censure upon those actions, both in gross and detail. To see the full force of these propositions, it is only necessary to apply the principles which have been already established.

If the people have not the means of knowing the actions of all public functionaries, they have no security for the good conduct even of their representatives. Suppose it is the duty of their representatives to watch the conduct of the judges, and secure the perfection of judicature, the people cannot know whether their representatives perform this duty, unless they know what the conduct of the judges is. Ignorance of this would of itself suffice to vitiate the government. A door would be left open, through which the rulers might benefit themselves at the expense of the people. All the profit to be made by an abuse of the power of justice, would thus become the profit of the representatives, by whom it would be allowed and encouraged, as far as the knowledge which they could not withhold from the people would permit.

That the people ought, therefore, to know the conduct of their judges, and when we say judges we mean every other functionary, and the more perfectly the better, may be laid down as indubitable. They are deprived of all trust-worthy means of knowing, if any limit whatsoever is placed to the power of censure.

All censure consists in the delivery of an unfavourable opinion, with or without the grounds of it. This is the essence of censure. But if the conduct of the judge deserves that an unfavourable opinion should be entertained of it, the more perfectly that is known to the people the better.

The conduct of the judge, on this occasion, says a defender, does not deserve an unfavourable opinion. A public expression of such an opinion ought, therefore, to be prohibited. But there are occasions on which the conduct of judges deserves an unfavourable opinion. When it is deserved, there is no security for good government, unless it is allowed to be made known. How can you allow an unfavourable opinion to be delivered in the one case, and not delivered in the other? To have the benefit of it in the one case, you must submit to the evil of it in the other.

In matters of Government, undeserved Praise is as mischievous as undeserved Blame.

As the real point of importance is, to establish correct opinions in the minds of the people, it is as mischievous to inculcate a favourable opinion when an unfavourable is deserved, as an unfavourable when a favourable is deserved; and, in the eye of reason, it is incontrovertible, that, if the one deserves to be prevented by punishment, so does the other.

But if an unfavourable opinion is pronounced of any public functionary—of a judge, for example—would you have it left uncontradicted? Would you not grant the liberty of calling in question the truth of the allegations, and of supporting a different opinion? If not, the character of no public functionary would be safe, and any man, however deserving, might be made to appear the proper object of the most unfavourable sentiments. Why should not the two cases be treated equally? Why should not the favourable, as well as the unfavourable opinion, be open to contradiction.

It is perfectly certain, that it is not in the power of law to mark out, by antecedent definition, any sort of men, of whom it can say, all opinions favourable to such men shall be punished. It can never be affirmed of any men beforehand, that they will certainly perform such and such injurious actions. If they do not perform them, all declarations conformable with the matter of fact are good. But the question is, whether they have performed them? One man affirms that they have. Is that to be taken for granted? And is no man to be allowed to affirm the contrary, and to sift the grounds upon which the allegations of the other man are supported? It is by weighing well the evidence on both sides that a well-founded opinion is capable of being formed. And it is certain, that the best security for having the evidence on both sides fully adduced, and the strength and weakness of it perfectly disclosed, is by permitting all those who are attached to different opinions to do what they can for the support of them.

If it is evident that it ought not to be permitted to speak evil of public functionaries without limit, while any limit is put to the power of speaking well of them; it is equally evident that, for the purpose of forming a correct opinion of their conduct, it ought not to be permitted to speak well of them, and oppose any limit whatsoever to the power of speaking ill of them.

It ought not to be permitted to speak evil of them without an equal liberty of speaking well; because, in that case, the evidence against them might be made to appear much stronger than it was. It ought not to be permitted to speak well of them without an equal liberty of speaking ill; because, in that case, the evidence in favour of them might be made to appear much greater than it really was. In either case, the people would be misguided, and defrauded of that moral knowledge of the conduct of their rulers, the paramount importance of which has so fully appeared.

It may be said (as by the short-sighted, if we did not anticipate them, it would be said), that if, by limiting the power of censure, the people are made to judge more favourably of their rulers than they deserve, the evil is small; but if they are permitted to form a very unfavourable opinion, the consequences are alarming.

We believe it may be rigidly demonstrated, that no evils are greater than those which result from a more favourable opinion of their rulers, on the part of the people, than their rulers deserve; because just as far as that undue favour extends, bad government is secured. By an opinion of their rulers more favourable than they deserve, is implied an ignorance on the part of the people of certain acts of their rulers by which the people suffer. All acts by which the rulers have any motive to make the people suffer, are acts by which the rulers profit. When the ignorance of the people extends to material points, all the evils of bad government are secured. These are the greatest of all possible evils. To this it will not be said that the ignorance of the people ought to extend. On all material points, it is admitted, then, that the freedom of censure ought to be complete. But if it is to be allowed on great points, on those where it is calculated to excite the greatest disapprobation; what can be thought of their consistency, who would restrain it on those where it is only calculated to excite a small? If it is proper to protect the people from great injuries at the hands of their rulers, by exciting a strong, it is good to protect them against small injuries, by exciting a weak disapprobation.

To public functionaries may be imputed either acts which they have not performed, or a want of certain qualifications, moral or intellectual, which they ought to possess.

With respect to acts, and even dispositions, which do not, either directly or indirectly, concern their public function, the same protection may be safely extended to them as to private men.

Acts, in their public capacity, which they have not performed, may be imputed to them either by mere forgery, and without any appearance of ground, or they may be imputed with some appearance of ground. From permitting the former, no good can be derived. They ought, therefore, to be prevented, in the same way as false imputations, injurious to individuals in their private capacity. That there should be no restraint in imputing actions to any public functionary which he may appear to have done, flows immediately from the principles already established, and requires not that any thing should here be added to its proof. Any appearance sufficient to lay the foundation of the slightest suspicion, renders it useful to call the attention of the public to the suspected part, which can only be done by making the suspicion known. A man may, indeed, publish, as a matter of fact, what is supported by appearances which would only justify the slightest suspicion. In that case, he is sure of incurring the disgrace of temerity, if not of malignity; and this is all the penalty which needs or can safely be inflicted upon him.

In imputing inaptitude to a public functionary, on the score either of intellectual or moral qualities, scarcely any limitation would be safe. Every man ought to have liberty to declare upon this subject any opinion which he pleases, and support it by any evidence which he may think adapted to the end. If, in supporting his opinion of the inaptitude of any public functionary, he imputes to him actions which there is not even an appearance of his having performed, that limited prohibition, the propriety of which we have just recognised, will strictly apply. With this exception, freedom should be unimpaired.

We have now, therefore, explained, we hope sufficiently, in what manner the principles which we have established require that the use of the press should be regulated in speaking of the actions of public functionaries, and of their fitness for the duties which they are appointed to discharge, whether those functionaries are the immediate representatives of the people, or others whom it is the business of those representatives to control.

Freedom of Censure on the Institutions of Government is necessary for the good of the People.

We have next to inquire in what manner those principles require that the use of the press should be regulated in speaking of the *institutions* of government. The illustrations already adduced will supersede the use of many words upon this part of the subject.

Institutions of government are good in proportion as they save the people from evil. Institutions of government are bad in proportion as they are the cause of evil to the people, either by what they create, or what they fail in preventing.

According to this statement, which it is impossible to controvert, institutions of government may, in strict propriety of speech, be said to be the cause of all the evil which they do not save the people from, and from which the people would be saved by any other institutions.

It is therefore of the highest importance that the people should know what are the institutions which save from the greatest quantity of evil, and how much their own institutions want of being those best institutions.

Institutions of government are bad, either because those in whose hands the powers of government are placed, do not know that they are bad, and, though willing, cannot improve them; or they are bad, because those who have in their hands the powers of government do not wish that they should be improved.

When the rulers are willing, but do not know how to improve the institutions of government, every thing which leads to a knowledge of their defects is desirable to both rulers and people. That which most certainly leads to such knowledge is, that every man who thinks he understands any thing of the subject, should produce his opinions, with the evidence on which they are supported, and that every man who disapproves of these opinions should state his objections. All the knowledge which all the individuals in the society possess upon the subject is thus brought, as it were, to a common stock or treasury; while every thing which has the appearance of being knowledge, but is only a counterfeit of knowledge, is assayed and rejected. Every subject has the best chance of becoming thoroughly understood, when, by the delivery of all opinions, it is presented in all points of view; when all the evidence upon both sides is brought forward, and all those who are most interested in showing the weakness of what is weak in it, and the strength of what is strong, are, by the freedom of the press, permitted, and by the warmth of discussion excited, to devote to it the keenest application of their faculties. False opinions will then be delivered. True; but when are we most secure against the influence of false opinions? Most assuredly when the grounds of those opinions are the most thoroughly searched. When are the grounds of opinions most thoroughly searched? When discussion upon the subject is the most general and the most intense; when the greatest number of qualified persons engage in the discussion, and are excited by all the warmth of competition, and all the interest of important consequences, to study the subject with the deepest attention. To give a body of rulers, or any other body of men, a power of choosing, for the rest, opinions upon government, without discussion, we have already seen, upon good evidence, is the way to secure the prevalence of the most destructive errors.

When institutions are bad, and the rulers would gladly change them if they knew they were bad, discussion, it will not be disputed, would be good for both parties, rulers and ruled. There is, however, another case, and that by far the most common, where the rulers are attached to the bad institutions, and are disposed to do all in their power to prevent any alteration. This is the case with all institutions which leave it in the power of the men who are intrusted with the powers of government, to make use of them for their own advantage, to the detriment of the people; in other words, which enable them to do injury to the people, or prevent the people from good. This is the case with by far the greater number of those institutions by which the people suffer. They are institutions contrived for benefiting the few at the cost of the many.

With respect, therefore, to the greater number of defective institutions, it is the interest of the rulers that true opinions should not prevail. But with respect to those institutions, it is of still greater importance to the people that discussion should be free. Such institutions as the rulers would improve, if they knew that they were defective, will be improved as the rulers themselves become sensible of their defects. Such defective institutions as the rulers would not wish to see improved, will never be improved, unless the knowledge of those defects is diffused among the people, and excites among them a disapprobation which the rulers do not think it prudent to disregard.

That the prevalence of true opinions among the people, relative to those defects in their political institutions, by which the rulers profit at their expense, is of the utmost importance to the people, is therefore a proposition which no improbity will dare openly to controvert. That freedom of discussion is the only security which the people can have for the prevalence of true opinions, has already been proved. It is therefore proved, that freedom of discussion, in its utmost perfection, they ought to enjoy.

What is included in the term, *freedom of discussion*, is evident from what has already been said.

Freedom of discussion means the power of presenting all opinions equally, relative to the subject of discussion; and of recommending them by any medium of persuasion which the author may think proper to employ. If any obstruction is given to the delivering of one sort of opinions, not given to the delivering of another; if any advantage is attached to the delivering of one sort of opinions, not attached to the delivery of another; so far equality of treatment is destroyed, and so far the freedom of discussion is infringed; so far truth is not left to the support of her own evidence; and so far, if the advantages are attached to the side of error, truth is deprived of her chance of prevailing.

To attach advantage to the delivering of one set of opinions, disadvantage to the delivering of another, is to make a choice. But we have already seen, that it is not safe for the people to let any body choose opinions for them. If it be said, that the people themselves might be the authors of this preference, what is this but to say, that the people can choose better before discussion than after; before they have obtained information than after it? No; if the people choose before discussion, before information, they cannot choose for themselves. They must follow blindly the impulse of certain individuals, who, therefore, choose for them. This is, therefore, a pretence, for the purpose of disguising the truth, and cheating the people of that choice, upon which all their security for good government depends.

If these deductions are as clear and incontrovertible as to us they appear to be, the inquiry respecting the principles which ought to regulate the use of the press is drawn pretty nearly to its close. We have shown that, as far as regards the violation of the rights of individuals, in respect to both persons and things, no definition on account of the press is required. We have shown in what manner the rights of individuals, in regard to reputation, should be defined by the civil code, and the violation of them prevented by the penal. We next proceeded to what may be considered as the main branch of the inquiry, namely, the use of the press in speaking of the institutions and functionaries of government. We have found that, in this respect, the freedom of the press is of such importance, that there is no ecurity for good government without it. We have also found, that the use of it, in respect to those subjects, admits of but two useful restrictions, that of a direct exhortaion to obstruct any of the operations of government in deail, and that of imputing to a functionary of government criminal act, which there was no ground, nor even an appearance of ground, to impute to him. These restrictions, f course, it would be very easy to define in the criminal ode, and to find appropriate motives to sanction. In all ther respects, we have seen that the press ought to be ree; that if there is any limit to the power of delivering nfavourable opinions respecting either the functionaries r the institutions of government, and of recommending hose opinions by any media, with the single exception of alse facts, under the circumstances mentioned above, the enefits which may be derived from the freedom of the ress are so greatly infringed, that hardly any security for ood government can remain.

V.—LIMITATIONS TO FREEDOM OF DISCUSSION, WHICH INVOLVE ITS DESTRUCTION.

In the administration of English law, or rather of what called law, upon this subject, without being any thing etter than the arbitrary will of the judges, it is said, that ough discussion should be free, it should be "decent;" nd that all "indecency" in discussion should be punished a libel. It is not our object in this discourse to give an xposition of the manifold deformities of the English law libel. If we have been successful in developing the true inciples which ought to regulate the freedom of the ess, every reader may, by an application of those princiles, determine what he ought to think of the several parculars which there may attract his attention. We shall confine ourselves to a short notice of those *dicta*, or doctrines, which seem most likely to be pleaded, in opposition to the principles which we have endeavoured to establish.

The question is, whether *indecent* discussion should be prohibited? To answer this question, we must, of course, inquire, what is meant by indecent.

In English libel law, where this term holds so distinguished a place, is it not defined?

English legislators have not hitherto been good at defining; and English lawyers have always vehemently condemned, and grossly abused it. The word "indecent," therefore, has always been a term under which it was not difficult, on each occasion, for the judge to include whatever he did not like. "Decent," and "what the judge likes," have been pretty nearly synonymous.

Indecency of discussion cannot mean the delivery either of true or of false opinions, because discussion implies both. In all discussion there is supposed at least two parties, one who affirms, and one who denies. One of them must be in the wrong.

The delivery, though not of all true opinions, yet of some, may be said to be indecent. All opinions are either favourable or unfavourable. True opinions that are favourable to government and its functionaries will not be said to be indecent; nor will all opinions that are true and unfavourable be marked out for prohibition under that name. Opinions unfavourable may either be greatly unfavourable or slightly unfavourable. If any unfavourable opinions are exempted from the charge of indecency, it must be those which are slightly so. But observe what would be the consequence of prohibiting, as indecent, those which are greatly unfavourable. A true opinion, greatly unfavourable to a functionary, or institution, of government, is an opinion that the functionary, or institution, is greatly hurtful to the people. You would permit the slight evil to be spoken of, and hence removed; you would not permit the great evil to be spoken of.

If no *true* opinion can be regarded as indecent, meaning by indecent, requiring *punishment*, we must inquire if any *false* opinion on matters of government ought to be treated as such. If all false opinions are indecent, all discussion is indecent. All false opinions, therefore, are not indecent. The English libel law does not treat any favourable opinions, how much soever false, as indecent. If all opinions that are false and unfavourable are said to be indecent, who is to judge if they are false? It has been already proved, that the people can confide the power of determining what opinions are true, what are false, to none but themselves. Nothing can resist the following argument. Either the people do know, or they do not know, that an opinion is false: if they do not know, they can permit nobody to judge for them, and must leave discussion its free course: if they do know, all infliction of evil for the delivery of an opinion which then can do no harm, would be purely mischievous and utterly absurd.

If all opinions, true and false, must be allowed to be delivered, so must all the media of proof. We need not examine minutely the truth of this inference, because it will probably be allowed. It will be said, however, that though all opinions may be delivered, and the grounds of them stated, it must be done in calm and gentle language. Vehement expressions, all words and phrases calculated to inflame, may justly be regarded as indecent, because they have a tendency rather to pervert than rectify the judgment.

To examine this proposition, it must be taken out of that state of vagueness in which so many things are left by the English law, and made, if possible, to speak a language, the meaning of which may be ascertained.

We have just decided, and, as it appeared, on very substantial grounds, that the statement of no opinion, favourable or unfavourable, true or false, with its media of proof, ought to be forbidden. No language necessary for that purpose can be indecent, meaning here, as before, nothing by that term, as nothing can be meant, but simply *punishable*, or proper for punishment.

But the only difference between delivering an opinion one way and another way is, that in the one case it is simply delivered, in the other it is delivered with indications of passion. The meaning of the phrase in question then must be, that an opinion must not be delivered with indications of passion.

What! not even a favourable one?

"Oh, yes; a favourable one. Merited *praise* ought to be delivered with warmth."

Here, then, is inequality, and therefore mischief, at once. An opinion, meaning here a true opinion, if it is favourable, you allow, if unfavourable, you do not allow, to be delivered in a certain way. Why? Because in that way, you say, it is calculated to make an undue impression. Opinions favourable, then, you wish to make an undue impression, and by that confess the wickedness of your intention. You desire that the people should think better of the institutions and functionaries of their government than they deserve; in other words, you wish the government to be bad.

If opinions, to what degree soever unfavourable, may be freely and fully delivered, there are two conclusive reasons why the terms in which they are delivered should not be liable to punishment. In the first place, the difference between one mode of delivery and another is of little consequence. In the second place, you cannot forbid the delivery in one set of terms, without giving a power of preventing it in almost all.

First, the difference is of little consequence. If I say barely that such a functionary of government, or such an institution of government, is the cause of great injury and suffering to the people, all that I can do more by any language is, to give intimation, that the conduct of such functionary, or the existence of such institution, excites in me great contempt, or great anger, or great hatred, and ought to excite them in others. But if I put this in the way of a direct proposition, I may do so, because then it will be a naked statement with regard to a matter of fact, and cannot be forbidden, without overthrowing the whole of the doctrine which we have already established.

If, then, I give indication of certain sentiments of mine, and of my opinion of what ought to be the sentiments of others *explicitly*, I ought, you say, to be held innocent; if *implicitly*, guilty. Implicitly, or explicitly, that is the difference, and the whole of the difference. If I say, that such a judge, on such an occasion, took a bribe, and pronounced an unjust decision, which ruined a meritorious man and his family, this is a simple declaration of opinion, and ought not, according to the doctrine already established, to meet with the smallest obstruction. If I also state the matter of fact with regard to myself, that this action has excited in me great compassion for the injured family, and great anger and hatred against the author of their wrongs, this must be fully allowed. I must further be allowed to express freely my opinion, that this action ought to excite similar sentiments in other members of the community, and that the judge ought to receive an appropriate punishment. Much of all this, however, I may say in another manner. I may say it much more shortly by implication. Here, I may cry, is an act for the indignation of mankind. Here is a villain, who, invested with the most sacred of trusts, has prostituted it to the vilest of purposes. Why is he not an object of public execration? Why are not the vials of wrath already poured forth upon his odious head? All this means nothing, but that he has committed the act; that I hate him for it, and commiserate the sufferers; that I think he ought to be punished; and that other people ought to feel as I do. It cannot be pretended, that between these two modes of expression, the difference, in point of real and ultimate effect, can be considerable. For a momentary warmth, the passionate language may have considerable power. The permanent opinion formed of the character of the man, as well as the punishment, which, under a tolerable administration of law, he can sustain, must depend wholly upon the real state of the facts; any peculiarity in the language in which the facts may have been originally announced soon loses its effect. If that language has expressed no more indignation than what was really due, it has done nothing more than what the knowledge of the facts themselves would have done. If it has expressed more indignation than what was due, the knowledge of the facts operates immediately to extinguish it, and, what is more, to excite an unfavourable opinion of him who had thus displayed his intemperance. No evil then is produced, or none but what is very slight and momentary. If there should be a short-lived excess of unfavourable feeling, we have next to consider what is the proper remedy. Punishment should never be applied where the end can be obtained by more desirable means. To desire any excess of unfavourable feeling, all that is necessary is to show the precise state of the facts, and the real amount of the evil which they import. All excess of feeling arises from imputing to the facts a greater efficacy in the way of evil than belongs to them. Correct this opinion, and the remedy is complete.

Secondly, you cannot forbid the use of passionate language, without giving a power of obstructing the use of censorial language altogether. The reason exists in the very nature of language. You cannot speak of moral acts in language which does not imply approbation and disapprobation. All such language may be termed passionate language. How can you point out a line where passionate language begins, dispassionate ends? The effect of words upon the mind depends upon the associations which we have with them. But no two men have the same associations with the same words. A word which may excite strains of emotion in one breast, will excite none in another. A word may appear to one man a passionate word, which does not appear so to another. Suppose the legislature were to say, that all censure, conveyed in passionate language, shall be punished, hardly could the vices of either the functionaries or the institutions of government be spoken of in any language which the judges might not condemn as passionate language, and which they would not have an interest, in league with other functionaries, to prohibit by their condemnation. The evil, therefore, which must of necessity be incurred by a power to punish language to which the name of *passionate* could be applied, would be immense. The evil which is incurred by leaving it exempt from punishment is too insignificant to allow that almost any thing should be risked for preventing it.

Religion, in some of its shapes, has, in most countries, been placed on the footing of an institution of the state. Ought the freedom of the press to be as complete, in regard to this, as we have seen that it ought to be, in regard to all other institutions of the state? If any one says that it ought not, it is incumbent upon him to show wherein the principles, which are applicable to the other institutions, fail in their application to this.

We have seen, that, in regard to all other institutions, it is unsafe for the people to permit any but themselves to choose opinions for them. Nothing can be more certain, than that it is unsafe for them to permit any but themselves to choose for them in religion.

If they part with the power of choosing their own religious opinions, they part with every power. It is well known with what ease religious opinions can be made to embrace every thing upon which the unlimited power of rulers, and the utmost degradation of the people, depend. The doctrine of *passive obedience* and non-resistance was a *religious doctrine*. Permit any man, or any set of men, to say what shall, and what shall not, be religious opinions, you make them despotic immediately. This is so obvious, that it requires neither illustration nor proof.

But if the people here, too, must choose opinions for themselves, discussion must have its course; the same propositions which we have proved to be true in regard to other institutions, are true in regard to this; and no opinion ought to be impeded more than another, by any thing but the adduction of evidence on the opposite side. (A. A. A.)

Liberty, in *Mythology*, was a goddess worshipped both amongst the Greeks and the Romans. Amongst the former she was invoked under the title *Eleutheria;* by the latter she was called *Libertas*, and held in singular veneration. Temples, altars, and statues were erected in honour of this deity; and there was consecrated to her on the Aventine hill by Tiberius Gracchus, a magnificent temple, before which was a spacious court called *atrium libertatis*. The Romans also erected a temple in honour of Liberty, when Julius Cæsar established his supremacy over them, as if their liberty had been secured by an event which proved fatal to its existence. In a medal of Brutus, Liberty is exhibited under the figure of a woman, holding in one hand a cap, the symbol of liberty, and in the other two poniards, with the inscription *idibvs Martiis*.

LIBITINA, in the Roman mythology, the goddess who presided over funerals. This goddess was the same with the *Venus Infera* or *Epithymbia* of the Greeks. She had a temple at Rome, where a certain piece of money was lodged for every person who died, and whose name was recorded in a register called *Libitinæ Ratio*. This practice was established by Servius Tullius, to obtain an account of the annual number of deaths in the city of Rome, and consequently the rate of increase or decrease of its inhabitants.

LIBITINARII, were undertakers whose office it was to take care of funerals, prepare all things necessary upon this solemn occasion, and furnish every article required. They obtained their livelihood by this gloomy business, and kept a number of servants to perform the working part of the profession, such as the *pollinctores*, *vespillones*, and others. The name *Libitinarii* is derived from *Libitina*, the goddess of funerals, in whose temple were sold all things relating to funerals. See Funeral.

LIBNA, in *Ancient Geography*, a sacerdotal city in the tribe of Judah, a place of strength, as appears from Sennacherib's laying siege to it (2 Kings, xix.; Isaiah, xxxvii.). In Jerome's time, it was a village, called *Lobna*, in the territory of Eleutheropolis.

LIBOURNE, an arrondissement of the department of the Gironde, in France, 544 square miles in extent. It comprehends nine cantons, which are divided into 143 communes, and contain 105,400 inhabitants. The capital is the city of the same name, situated on the right bank of the Dordogne, where the water of the river Isle falls into it. It is surrounded with walls and pleasing promenades, and contains 900 houses and 8400 inhabitants, whose chief occupations consist in making woollen goods, porcelain, glass and leather, and collecting salt and wine. Long. 0. 21. W. Lat. 44. 55. N.

LIBRA, or Balance, one of the mechanical powers. See Balance.

Libra, in *Astronomy*, one of the twelve signs of the zodiac, exactly opposite to Aries, and so called because when the sun is in this sign at the autumnal equinox, the days and nights are equal, as if weighed in a balance. The stars in this constellation are, according to Ptolemy 17, to Tycho 10, to Hevelius 20, and to Flamsteed 51.

Libra also denotes the ancient Roman pound, borrowed from the Sicilians, who called it *litra*.

The libra was divided into 12 *unciæ* or ounces, and the ounce into 24 scruples. The divisions of the libra were, the *uncia*, one twelfth; the *sextans*, one sixth; the *quadrans*, one fourth; the *triens*, one third; the *quincunx*, five ounces; the *semis*, six; the *septunx*, seven; the *bes*, eight; the *dodrans*, nine; the *dextrans*, ten; and the *deunx*, eleven; whilst the *as* weighed twelve ounces or one libra.

The Roman libra was used in France for the proportions of their coin till the time of Charlemagne, or perhaps till that of Philip I. in 1093, their sols being so proportioned that 20 of them were equal to the libra. By degrees it became a term of account; and every thing of the value of twenty sols was called a *livre*.

Libra Pensa, in our law books, denotes a pound of money in weight. It was usual in former days not only to tell the money, but to weigh it, because many cities, lords, and bishops, having their mints, coined money, and often very bad money too; for which reason, though the pound consisted of twenty shillings, they always weighed it.

LIBRARII, amongst the ancients, were a sort of copyists who transcribed in beautiful or at least legible characters, what had been written by the *notarii* in notes and abbreviations.

LIBRARIES.

Library, in common language, means either an apartment or edifice destined to contain books placed regularly upon shelves, or the books themselves which are therein disposed and arranged. It is in the latter sense only that the term is employed in the present article. The necessity of preserving, in distinct forms, writings relating to particular subjects, first led to the formation of books; and the convenience of being able to compare different writings on the same subject, or to consult various writings on different subjects, naturally suggested the assemblage of books, any considerable collection of which constitutes a library. Hence in almost all parts of the world where civilization has made any considerable progress, traces may be discovered of the existence of libraries. At the period of the Spanish invasion of South America, for instance, emblems or pictural representations were employed instead of writing, letters being wholly unknown; in Yucatan and Honduras there were books composed of the leaves of trees; and in the kingdom of Mexico the natives had a *library*, histories, and calendars, in which they painted such things as had proper figures by their natural representations, and such as had none, by means of various other characters, so that they expressed in this way whatever they pleased.[1] This may be considered as a library in its earliest stage; for all those which are described as having belonged to the ancients were composed of rolls, which, though different in form from our books, supplied the place of them, and, when collected, constituted a library, even in the modern acceptation of that term.

Origin of libraries.

The origin of libraries is involved in obscurity. According to some, the distinction of having first made collections of writings belongs to the Hebrews; but others ascribe this honour to the Egyptians. Those who support the former opinion contend that the care which the Hebrews bestowed in preserving their sacred books, in which the history and fortunes of their ancestors, as well as their laws, were recorded, became an example to other nations; whilst those who hold the latter opinion maintain that, as the civilization and learning of Egypt were of much higher antiquity than in almost any other country with the history of which we are acquainted, and as the art of writing was known and practised therein from the earliest times, indeed long before knowledge had dawned amongst any other people, so it may be presumed that collections of books first began to be made in that region where the art of writing seems to have been originally invented. This question, however, is not one which it is of importance to discuss. It is sufficient to observe, that, in ancient Egypt, the priests appear, from the earliest times, to have kept records or archives, in a character expressly appropriated for the purpose, and hence called hieratic or sacerdotal; that consequently every sacred college contained a library, composed in part at least of such archives; and that, besides, they had written books, in which were inscribed all the knowledge, whether of science or of art, which had either descended to them from their predecessors, or had been the fruit of their own labour and research.

I.—ANCIENT LIBRARIES.

As the earliest form of the graphic art appears to have consisted in inscribing or engraving characters on stone, metal, wood, or other durable substance, so the first public libraries were composed exclusively of archives deposited in the temples, that the acts relating to history and public law might there be preserved. This will be found to hold true almost universally. Men invariably begin with what is absolutely necessary to their well-being; and it is only after the lapse of a long interval that time and the progress of improvement add the useful to the necessary, and the ornamental to the useful.

Libraries of the Egyptians.

Osymandyas, one of the ancient kings of Egypt,[2] is said to have been the first who founded a library, and established it in a division or compartment of the edifice which has sometimes been called his palace and sometimes his tomb. On the entrance was inscribed the words, Ψυχης Ιατρειον, *Medicine of the Soul;* whilst the sculptures upon the walls represented a judge, with the image of truth suspended from his neck, and many books or rolls lying before him. Such is the account given by Diodorus,[3] who had himself visited Egypt, but who merely mentions the fact, without giving us any information as to its contents. It probably contained works of very remote antiquity, and also the books accounted sacred by the Egyptians, all of which perished amidst the destructive ravages which accompanied and followed the Persian invasion under Cambyses. There was also, according to Eustathius and other ancient writers, a fine library at Memphis, deposited in the temple of Phtha, from which Homer has been accused of having stolen both the Iliad and the Odyssey, and afterwards published them as his own. (See the article HOMER.) From this charge, however, the bard has been vindicated by various writers, and by different arguments.

But the most superb library of Egypt, perhaps of the ancient world, was the one founded by Ptolemy Soter, at Alexandria, and enriched by successive sovereigns of that country. About the year 290 B. C. Ptolemy Soter, a learned prince, founded an academy at Alexandria, called the Museum, where there assembled a society of learned men, who were devoted to the study of philosophy and the sciences; and for their use he formed a collection of books, the number of which has been variously computed, by Epiphanius at 54,000, and by Josephus at 200,000.[4] His son Ptolemy Philadelphus, an equally liberal and enlightened prince, collected great numbers of books in the temple of Serapis, in addition to those accumulated by his father, and at his death left in it about 100,000 volumes. He had agents in every part of Asia and of Greece, commissioned to search out and purchase the rarest and most valuable writings; and amongst those he procured were the works of Aristotle, purchased of Neleus,[5] and the Greek version of the Jewish Scriptures, designated the Septuagint, which was undertaken at the suggestion of Demetrius Phalereus, who first executed the office of librarian to this monarch. The measures adopted by Ptolemy Philadelphus, for augmenting the Alexandrian Library, were pursued by his successor Ptolemy Euergetes, with unscrupulous vigour. He caused all books imported into Egypt by Greeks or other foreigners to be seized and sent to the academy or museum, where they were transcribed by persons employed for the purpose; upon which the copies were delivered to the proprietors, and the originals deposited in the library. He borrowed of the Athenians the works of Sophocles, Euripides, and Æschylus; caused them to be transcribed in the most elegant manner possible; retained the originals for his own library; and returned to the Athenians the copies which had been made of them, with fifteen talents[6] for the exchange. As the museum, where the library was originally founded, stood near the royal palace, in the quarter of the city called Bruchion, the books were at first deposited there; but when this building had been completely occupied with books to the number of 400,000 volumes, a supplemental library was erected within the Serapeion, or temple of Serapis; and the books there placed gradually increased to the amount of 300,000 volumes; thus making, in both libraries, a grand total of 700,000 volumes.

The Alexandrian Library continued in all its splendour until the first Alexandrian war, when, during the plunder of the city, the Bruchion portion of the collection was accidentally destroyed by fire, owing to the recklessness of the auxiliary troops. But the library in the Serapeion still remained, and was augmented by subsequent donations, particularly by that of the Pergamean Library, amounting to 200,000 volumes, presented by Mark Antony to Cleopatra; so that it soon surpassed the former both in the number and in the value of its contents. At length, after various revolutions under the Roman emperors, during which the collection was sometimes plundered and sometimes re-established, it was utterly destroyed by the Saracens, under the orders of the Caliph Omar, when they acquired possession of Alexandria, A. D. 642. Amrou, the victorious general, was himself inclined to spare this inestimable treasury of ancient science and learning; but the ignorant and fanatical caliph, to whom he applied for instructions, ordered it to be destroyed. "If," said he, "these writings of the Greeks agree with the Koran, or book Allah, they are useless, and need not be preserved; if they disagree, they are pernicious, and ought to be destroyed." The sentence of destruction was executed with blind obedience. The volumes of parchment or papyrus were distributed to the four thousand baths of the city; and such was their incredible number, that six months were scarcely sufficient for their combustion.[1]

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[1] Herrera, decade ii. book ix. c. 4.

[2] He is supposed to have lived 600 years after the Deluge, or about the year of the world 2250.

[3] Diodorus Siculus, lib. i. c. 2.

[4] *Encyclopédie*, tom. ii. art. *Bibliothèque;* Joseph. *Ant. Jud.* lib. xii. c. 2.

[5] Athenæus, lib. i. c. 4, ed. Schweighæuser.

[6] Upwards of L.3000 sterling.

The ancient Greeks, whose poetry has been to us the primary source of all our profane literature, had as yet no other theology than the system which resulted from observations made on the theory of the different parts of nature, when the Hebrews, in the books of Moses, cited by one of those ancient historians who copied the chronicles,[2] read the account of the creation, and, along with it, a summary of the traditions of fifteen centuries of continuous history. These books composed the first collection of the Hebrews; but subsequently this people, like most others, had their archives. Those which Herod caused to be burned, with the intention of destroying the monuments of the ancient families, appear to have reached as far back as the very origin of the nation.[3] But though he consigned the public records to the flames, those of individuals were beyond his power, and afterwards served to re-establish the history of this subjugated people. There also existed libraries, properly so called, in Judæa. One in particular is supposed to have been attached to, if not kept in, the temple of Jerusalem, and the Hebrew authors speak of "the multitude of books;" an expression which seems to imply that the collection was not confined to the sacred books alone, but included others, relating probably to the laws and institutions of Moses, and the history of the Jewish nation. The books, particularly those of history, had indeed become so numerous, that Judas Maccabeus caused extracts to be made and circulated from those contained in the library of Nehemiah,[4] mentioned in the second book of Esdras, in which also were preserved the writings of the prophets, the compositions of David, the letters of the Hebrew kings, and the records of offerings. As the Jews dwelt alone, and were not reckoned amongst the nations, we know nothing of their early literature, beyond the books which are contained in the Old Testament. It has been supposed, however, that they had some cities celebrated on account of the sciences which were there cultivated. Amongst these may be mentioned the town called by Joshua *Kiriath-sepher*, or the *City of Letters*, which was situated near the confines of the tribe of Juda. In later times, the university or school of Tiberias was not less celebrated. It is probable that this and other academies of the same description were furnished with libraries.[5]

Libraries of the Persians.

Scripture also mentions a library of the kings of Persia, which some suppose to have consisted of the historians of that nation, and of memoirs on the affairs of state, but which appears rather to have been a depository of the laws, charters, and ordinances of the Persian kings. In the Hebrew text it is stated that a search was made "in the house of the *rolls*, where the *treasures* were laid up in Babylon," for a decree issued by Cyrus ordaining a temple to be built at Jerusalem; the ordinance sought for, however, was found, not in Babylon, but at Acmetha, in Media.[6] It appears that "the house of the rolls" was not a library belonging to the Persians, but a collection of the records or archives of the kingdom. There was formerly a considerable library at Susa, the residence of the Persian sovereigns, where Metasthenes consulted the annals of the Persian monarchy, in search of materials for his history. This library is mentioned by Diodorus Siculus; but, like that referred to by Ezra, it seems rather to have been a collection of laws and records, than an assemblage of books on science or learning.

Libraries of the Greeks.

Amongst the Greeks, as amongst other nations, the first libraries consisted merely of archives, deposited, for the sake of preservation, in the temples of the gods. The sacred books, of which mention is made by Dionysius of Halicarnassus, under the denomination of Deltoids, were of this description. Amongst the most ancient people of Greece these archives comprehended also the genealogies of the royal families; the successions of the priesthood, which served to fix historical epochs; and the titles of public property, engraved, according to their importance, on marble and on brass. Tacitus attests the existence of one of these titles, which was dated twelve hundred years before his time, and the authenticity of which was recognised by the senate in the time of Tiberius.[7] Amongst the archives were likewise preserved the ancient chronicles, of which the historians of an epoch anterior to the Peloponnesian war had confined themselves to transcribing the contents, with a rigorous fidelity, without either adding or retrenching any thing, not even the circumstances invented in the fictions of mythology, which criticism soon learned to discriminate and to separate from the actual facts.[8] Of Grecian literature or history we have no authentic information prior to the wars of Thebes and of Troy; and it would therefore be fruitless to seek for any traces of books in that nation before those events. The Lacedæmonians had no books; amongst them writing was considered as a superfluous accomplishment. At Athens, on the contrary, the sciences and literature were diligently cultivated.

Pisistratus the tyrant was the first who established a public library in that city, though Strabo ascribes to Aristotle the honour of having rendered this important ser-

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[1] Hartwell Horne, *Introd. to the Study of Bibliography*, vol. i. p. vi. et seq. Gibbon (*Decl. and Fall of the Roman Empire*, vol. ix. p. 40) has endeavoured to disprove the positive account given by Abulfaragius, by means of negative arguments. It should be con- idered, however, that the direct and positive statement of an historian of such unquestionable credit as Abulfaragius, cannot be set side by arguments of a negative and hypothetical character. Besides, Gibbon's references to Aulus Gellius, Ammianus Marcelli- ius, and Orosius, are foreign to the purpose; inasmuch as the destruction referred to by these writers is that which took place in he time of Julius Cæsar, after which the library was restored, and continued to flourish, until it was annihilated by the Saracens, in onsequence of the decree of Omar.

[2] Hellanicus apud Justinum, *Ad Græcos Cohortat.* p. 18.

[3] Eusebius, *Historia Eccles.* lib. i. c. 7.

[4] Inferebantur autem in descriptionibus, et commentariis Nehemiæ hæc eadem; et ut construens *bibliothecam* congregavit de regio- ibus *libros*, et prophetarum, et David, et epistolas Regum, et de Donariis. (*Machab.* lib. ii. c. ii. v. 13.) Considerantes enim *mul- itudinem librorum*...hoc opus breviandi causa suscepimus. (*Machab.* lib. ii. c. ix. v. 25.)

[5] *Encyclopédie*, tom. ii. p. 229.

[6] Ezra, chap. v. verse 17; and vi. 1, 2.

[7] "Auditæ dehinc Lacedæmoniorum et Messeniorum legationes, de jure templi Dianæ Limnatidis, quod suis a majoribus, uaque in terra dicatum, Lacedæmonii firmabant annalium memoria, vatumque carminibus...Contra Messenii, veterem inter Her- ulis posteros divisionem Peloponnesi, protulêre, suoque regi Dentheliatem agrum, in quo id delubrum cessisse; monimentaque jus rei sculpta saxis, et aere prisco manere." (Tacitus, *Annal.* lib. iv. sect. 43.)

[8] Dionysius Halicarnasseus, *de Thucyd. Judic.* p. 133.

Ancient Libraries.

vice to his countrymen. In this library he deposited the works of Homer, which he had collected with great difficulty, and at a very considerable expense; and the Athenians themselves were at great pains to increase the collection. The fortunes of this library were various and singular. It was transported to Persia by Xerxes; brought back by Seleucus Nicator; plundered by Sylla; and at last restored by the Emperor Hadrian. On the invasion of the Roman empire by the Goths (A. D. 260), Greece was ravaged; and in the sack of Athens they had collected all the libraries, and were upon the point of setting fire to this funeral pile of ancient learning, when one of their chiefs interposing, dissuaded them from the design, observing at the same time, that as long as the Greeks were addicted to the study of books, they would never apply themselves to that of arms.

Library of Pergamus.

Next to the Alexandrian Library, that of Pergamus was the most conspicuous, and, according to Plutarch, contained 200,000 volumes. It was founded and successively enriched by the kings of Pergamus called Eumenes, all of whom were zealous promoters of the arts, and to one of whom we are indebted for the invention of parchment (*charta Pergamena*). Attalus surpassed all his predecessors in magnificence, and after their example devoted part of his treasures to the purchase of the principal works or writings of his age. As already noticed, the Pergamean library was presented by Antony to Cleopatra, in order to form the foundation of a new library at Alexandria. Vitruvius makes honourable mention of both these libraries.[1] There were other collections of less magnitude, amongst which has been mentioned that of Tyrannion, a grammarian contemporary with Pompey, which is said to have contained about 30,000 volumes.

Places where manuscripts may be supposed still to exist.

These particulars, scanty as they may no doubt seem, are nevertheless sufficient to show that the libraries of Greece, in ancient times, were both numerous and extensive. But a question of much more immediate interest here presents itself, viz. as to whether any of the treasures with which they were enriched still remain undiscovered, and where these may be supposed most likely to be found. On this subject various conjectures have been formed, particularly in regard to the remains of the ancient Greek historians. It is well known that many manuscripts had been collected at a vast expense in Greece for the library of Buda, which was destroyed by the Turks in the year 1526. In this library Alexander Brassicanus had seen the whole of the *Hyperides* with *scholia*, the works of many of the Greek fathers, and also those of the classical writers. From it issued parts of Polybius and of Diodorus Siculus. A manuscript of Heliodorus, from which was afterwards printed the first edition of the *Æthiopica*, likewise belonged to it, having been found by a soldier, who carried it to Vincentius Obsopæus. Neander, speaking of this collection, says, "Ex media Græcia inæstimandis sumptibus emerat Matthias Corvinus rex."[2]

Constantinople and Athos have contributed the greater number of the manuscripts which are still extant in different parts of Europe. Until a comparatively recent period there were monasteries full of learned men at Byzantium, and every monastery had its library. The Turks, on their conquest of Constantinople, did not indulge in that indiscriminate destruction which has sometimes been imputed to them. Mahommed II. secured the library of the Greek emperors, which his successors preserved until it was destroyed by Amurath IV. At Byzantium, Constantine Lascaris transcribed many of the works which were afterwards conveyed to the Royal Library at Madrid; and in this city were procured those manuscripts which, having been presented to Hurtado de Mendoza by Solyman II., were left by the former to the library of the Escorial. Possevin has given partial catalogues of some of the libraries at Constantinople; and an early traveller, who visited that city in the year 1597, mentions a valuable collection which he had seen there, though without specifying its contents. With respect to Athos, it appears that there were deposited in one library alone, two hundred manuscripts originally obtained from the monasteries upon the mountain; and a great part of those formerly at Moscow had been collected by the monk Arsenius, in Athos, at the suggestion of the patriarch Nicon. Thessaly, Chios, Corfu, Crete, Cyprus, Chalce,[3] Rhodes, and Epidauria, may also be mentioned as places which, at different times, have supplied manuscripts.[4]

Mr Walpole is of opinion, that notwithstanding the acquisitions which have already been made, researches in the Levant should not be intermitted. By these many manuscripts may still, according to him, be rescued from destruction. No care whatever appears to have been taken to preserve them. Dr Covell mentions having seen, in the monasteries of Mount Athos and elsewhere, vast heaps of manuscripts of the Fathers, and other learned authors, all covered over with dust and dirt, many of them rotten and spoiled, and never in any instance placed upon shelves or arranged in good order. Mr Walpole also thinks that an inquiry should be made into the truth of what was stated to Hemsterhusius by some Greeks, viz. that part of the comedies of Menander was still extant. "Application," says he, "might be made to the Greek nobles of the Phanar, many of whom are versed in ancient Greek, and probably the possessors of some valuable manuscripts. Parts of the first book of the *Demonstratio Evangelica* of Eusebius were printed by Fabricius, from a manuscript belonging to Prince Mavrocordato; and a copy of the Greek Orators, now in England, was once the property of a Greek noble." This, however, is, we fear, much too sanguine. It is probable that many Greek manuscripts have experienced the treatment which works of the same sort have met with in other countries. Poggius, whilst at the council of Constance, found a manuscript of Quintilian upon the table of a pickling shop. Masson met with one of Agobardus in the hands of a bookbinder, who was preparing to use it for the back of a book; and one of Asconius was about to be employed for the same purpose. In the roof of a Benedictin monastery, Musculus discovered some of the works of Cicero, and the whole of Ovid. Numbers of manuscripts in Greece are irrecoverably lost, either by design or accident, by the casualties of war or the havoc of revolution; and of those which may hereafter be met with, it can scarcely be supposed that almost any will prove to be of much value, or of any great antiquity.

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[1] Tertull. *Apol.* c. 18. Vitruvius, lib. vii. in *præfat.* "Reges Attalici," says he, "magnis philologiæ dulcedinebus inducti, cum *egregiam Bibliothecam Pergami* ad communem delectationem instituissent; tunc item Ptolemæus, infinito zelo cupiditatisque incitatus studio, non minoribus industriis ad eundem modum contenderat Alexandriæ comparare." (*Argentorati*, 1807.)

[2] *Epistolæ*, p. 10.

[3] The island in the Propontis or Sea of Marmora.

[4] If the life of Professor Biornstahl had been prolonged, we should probably have received much valuable information concerning the libraries in the monasteries of Thessaly. He had visited all of them, and had resided many days at Triccala for the express purpose of copying a Greek manuscript belonging to a monastery. But having been attacked by fever at the foot of Mount Olympus, he remained ten days without medical assistance, after which he was taken to Salonica, where he died in July 1779. Since his death, no one appears to have resumed the search which he had so diligently pursued.

Ancient Libraries.

A list of the theological manuscripts in the library of Patmos has been given by Possevin; and another, copied by the Marquis of Sligo, has been published by Mr Walpole. The actual catalogue contains the titles of ninety-two manuscripts, and about 400 printed volumes; but the Greek compiler has not stated any circumstance relating to the manuscripts by which an estimate of their value may be formed. He gives no information concerning the form of the letters or that of the spirits, or upon any of those subjects by which a knowledge of their respective dates might be obtained. But there is one manuscript mentioned in the catalogue, in regard to which it is impossible not to feel more than ordinary curiosity. We allude to a manuscript of Diodorus Siculus, an accurate inspection of which would probably determine whether the hopes which were oftener than once entertained, of recovering the lost books of that historian, were in this instance also to be disappointed.[1] But, without dwelling longer upon particulars, we may observe, that notwithstanding the sanguine expectations entertained by the admirers of ancient learning, very few valuable manuscripts have latterly been discovered; and, with the exception of the fragments of ancient authors, deciphered from palimpsest or rescribed manuscripts, it must be admitted, that those accidentally rescued from destruction have, in general, been either of comparatively modern date or of but little consequence. Neither the inquiries which have been extended to the African states, nor the excavations and researches made at Herculanum and Pompeii, have recovered the lost historians, or indeed brought to light any works of importance.[2] (See the article HERCULANEUM.)

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ies.

Rome was still in its infancy when the archives of the Etruscans contained a continuous collection of public acts, and particularly an uninterrupted series of births and deaths, that enabled that people to fix the unequal duration of the eight centuries of their previous history, which they reckoned up to about the middle of the sixth century before Christ. The details given by Censorinus in Varro, prove that the Etruscans kept regular registers of births and deaths, from the epoch of their first establishment in Italy, which Larcher refers to the year 1344 before Christ; that, the eighth century thereafter, to which the Etruscan histories were written, must have been the sixth before the Christian era, in which other histories appeared that are no longer extant; and that, during these eight hundred years, the most extended term of human life was nearly the same as at the present day. In the works of Dionysius of Halicarnassus, of Plutarch, and other ancient authors, we also discover scattered glimpses of the history of Italy in the most remote times, and learn that the tribes or races by whom the Etruscans were surrounded had also their historical archives. It may even be supposed that the Romans, in causing their Capitoline marbles to be engraved, followed, amongst others, the example of Præneste; a city much more ancient than Rome, and which had long continued the practice of classifying as well as engraving its municipal records. Such were the sources consulted by several historians who treated of the antiquities of different Italian nations, particularly Zenodotus of Trœzene, who composed a history of the Ombrians.

Roman libraries.

If the ancient Greeks had but few books, the ancient Romans possessed still fewer. Incessantly occupied in military expeditions, defensive wars, and the aggrandisement of their empire, that warlike people had no leisure, and, probably, as little inclination, to cultivate letters. It was not until they had subdued Magna Græcia that they began to emerge out of barbarism, nor until they had accomplished the conquest of Greece itself, that a taste for the arts, sciences, and books was diffused amongst them. They became civilized by frequent contact and familiarity with civilization. The immediate consequence of the conquest of Greece was a more frequent intercourse with the Greeks, at once their subjects and their masters; and in proportion as they became acquainted with the literature and arts of that refined people, the asperity of character and manners which had distinguished this nation of conquerors began to disappear.

Libraries in Rome.

The first library established at Rome was that founded by Paulus Æmilius, B. C. 167. Having subdued Perses, king of Macedonia, he enriched the city of Rome with the library of this conquered monarch, which was subsequently augmented by Sylla.[3] On his return from Asia, where he had successfully terminated the first war against Mithridates, Sylla visited Athens, whence he took with him the library of Apellicon the Teian, in which were the works of Aristotle and Theophrastus. Lucullus, another conqueror of Mithridates, was not less distinguished by his taste for books. The number of volumes in his library was immense; and they were written in the most distinct and elegant manner possible. But the use which he made of his collection was still more honourable to that princely Roman than the acquisition or possession of it. His library was open to all; and the Greeks, who visited Rome, resorted to the galleries and porticos of Lucullus as to the retreat of the Muses, where they spent whole days in conversation on literary subjects. But although both Sylla and Lucullus liberally gave public access to their literary treasures, still their libraries can, in strictness, be considered as only *private* collections. Amongst the various projects which Julius Cæsar had formed for the embellishment of Rome was that of a *public* library, which should contain the largest possible collection of Greek and Latin works; and he had assigned to Varro the duty of selecting and arranging them; but this design was frustrated by the assassination of the dictator, and the establishment of public libraries did not take place until the reign of Augustus.

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[1] See Mr Walpole's observations on this subject, published in Dr Clarke's *Travels*.

[2] *Mémoires de l'Académie des Inscriptions*, tom. vii.; *Nouveau Traité de Diplomatique par deux Benedictins*; Villoison, *Anecdota Græca*, tom. ii.; Fabricius, *Bibliotheca Græca*, tom. xiv.—A letter written at Patmos on the 28th of February 1832, by Professor Thiersch of Munich, gives some interesting information respecting the library of that celebrated island. "We left Geronta on the 23d February," says he, "and reached this island, after experiencing the fury of a violent storm. The town is situated upon the summit of a mountain in the rear of the harbour, and, rising above it like a citadel, stands the monastery of John the Baptist." After the travellers had dried themselves in a storehouse at the harbour, they proceeded to pay their respects to the Hegumenos of the monastery, and the patriarch of Alexandria, who was upon a visit to his birth-place, Patmos; and Thiersch and his companions met a hearty welcome under the prelate's roof, and were received in the far-famed library of the fraternity of monks, which was their principal inducement to visit the island; but, as far as manuscripts connected with ancient literature were concerned, they found none of striking importance. A codex of Diodorus Siculus, extending from the eleventh to the eighteenth book, contained nothing but what has appeared in print; and the readings, so far as Thiersch had an opportunity of investigating them, were not of much interest. He attached greater value to a manuscript of Paulus Ægineta, which is of the ninth or tenth century, and upon a careful examination of which he expresses a confident opinion, that valuable emendations may in consequence be made on the text of Ægineta's work. The library contains enough in grammatical treatises, glossaries, lexicons, and scholia, to afford employment to a young philologist for six months at least; and it is particularly rich in ancient manuscripts of the Bible, amongst which are a Greek manuscript of the book of Job, another of two of the Gospels with commentaries, a third exhibiting the musical characters of the Greek church, and others containing the works of some of its fathers. As these are considered in the light of sacred relics, none of them have been injured, and they are in a respectable state of preservation. But the heathen manuscripts, on the contrary, lie scattered about and cut to pieces; whilst those on cotton paper, having been severely treated by the moths, were, in the course of the last century, thrown by the monks into the oven which they used for baking their bread; an act of literary sacrilege for which these monastic destroyers deserved to have been themselves baked in their own oven. Three or four, which chance saved from destruction, were purchased by Dr Clarke, and are now safely deposited in the Bodleian Library at Oxford. (*Journal of Education*, vol. pp. 176, 177.)

[3] Such is the statement of Isidorus (*Origines*, l. vi. c. 4), though Plutarch (*in Vit. Æmil.* tom. ii. p. 180, ed. Bryan) expressly says that he reserved for his sons, who were literary men, the books taken from the library of King Perses.

The honour of suggesting these valuable institutions is ascribed by the elder Pliny[1] to Assinus Pollio, who erected a public library in the Court of Liberty on the Aventine Hill. Augustus, amongst other embellishments which he bestowed upon Rome, erected two public libraries, viz. the Octavian and the Palatine.[*] The Octavian Library, which was thus denominated in honour of the emperor's sister, stood in the portico of Octavia; and the charge of it was committed to Melissus, who had been manumitted by Augustus. The Palatine Library was added by Augustus to the temple of Apollo, which he had erected on the site of that part of the Palatine House which had been struck by lightning. There were deposited the corrected books of the Sybils; and, from two ancient inscriptions quoted by Lipsius and Pitiscus, it would seem that it consisted of two distinct collections, one Greek and the other Latin. This library having survived the various revolutions of the Roman empire, existed until the time of Gregory the Great, whose mistaken zeal led him to order all the writings of the ancients to be destroyed.[2] The successors of Augustus, though they did not equally encourage learning, were not altogether neglectful of its interests. Suetonius informs us that Tiberius founded a library in the new temple of Apollo; and we learn from some incidental notices, that he instituted another in his own house, called the Tiberian Library. Vespasian, following the example of his predecessors, established a library in the Temple of Peace, which he erected after the burning of the city by order of Nero; and even Domitian, in the commencement of his reign, restored at great expense the libraries which had been destroyed by the conflagration, collecting copies of books from every quarter, and sending persons to Alexandria to transcribe volumes in that celebrated collection, or to correct copies which had been made elsewhere. Various writers have asserted that there was a library attached to the Temple of the Capitol; but they have not informed us by whom it was founded. Lipsius ascribes it to Domitian, whilst Donatus refers it to the Emperor Hadrian, by whom it was at least enlarged, if not founded, and who probably erected the Tiburtine Library, at Tibur, in the vicinity of Rome.[3] But the most magnificent of all the libraries founded by the sovereigns of imperial Rome was that of the Emperor Ulpius Trajanus, from whom it was denominated the Ulpian Library. It was erected in Trajan's Forum, but afterwards removed to the Viminal Hill, to ornament the baths of Diocletian. In this library were deposited the elephantine books, written upon tablets of ivory, wherein were recorded the transactions of the emperors, the proceedings of the senate and Roman magistrates, and the affairs of the provinces. It has been conjectured that the Ulpian Library consisted of both Greek and Latin works; and some authors affirm that Trajan commanded all the books which could be found in the cities he had conquered to be immediately conveyed to Rome, in order to increase his collection. The library of Domitian having been consumed by lightning, in the reign of Commodus, was not restored until the time of Gordian, who rebuilt the edifice, and founded a new library, adding thereto the collection of books bequeathed to him by Quintus Serenus Samonicus, the physician, amounting, it is said, to no less than 72,000 volumes. Donatus conjectures that this library was deposited in the palace of Pompey.[4]

In addition to the imperial libraries, there were others to which the public had access in the principal cities and colonies of the empire. Pliny mentions a public library which he had founded for the use of his countrymen; and Vopiscus informs us that the Emperor Tacitus caused the historical writings of his illustrious namesake to be deposited in the libraries. The number of calcined volumes, which have been excavated from the ruins of Herculanum and Pompeii would also seem to indicate that collections of books were common in those cities. (See the article HERCULANEUM). But the irruptions of the barbarians who overran and desolated the western empire proved more destructive to the interests of literature than either volcanoes or earthquakes, and soon caused the disappearance of those libraries which, during several centuries, had been multiplied in Italy. The libraries of the East, however, escaped this devastating torrent; and both Alexandria and Constantinople preserved their literary treasures, until the capture of those cities by the Saracens and the Turks, who finally subverted the Roman empire in the East.[5]

When Constantine the Great (A. D. 336) made Byzantium the seat of his empire, he decorated that city with splendid edifices, and called it after his own name. Desirous to make reparation to the Christians for the injuries they had suffered during the reign of his predecessor, he commanded the most diligent search to be made after those books which Diocletian had doomed to destruction; he caused transcripts to be made of such as had escaped the fury of the Pagan persecutor; and, having collected others from various quarters, he formed the whole into a library at Constantinople. On the death of Constantine, however, the number of books in the imperial library was only 6900; but it was successively enlarged by the Emperors Julian and Theodosius the younger, who augmented it to 120,000 volumes. Of these, more than half were burned, in the seventh century, by the command of the Emperor Leo III. who thus sought to destroy all the monuments that might be quoted in proof respecting his opposition to the worship of images. In this library was deposited the only authentic copy of the Council of Nice; and it is also said to have contained the poems of Homer, written in gold letters, together with a magnificent copy of the Four Gospels, bound in plates of gold, enriched with precious stones; all of which were consumed in the conflagration. The convulsions which distracted the lower empire were by no means favourable to the interests of literature. In the eleventh century learning flourished for a short time during the reign of Constantine Porphyrogennetus; and this emperor is said to have employed many learned Greeks in collecting books, and forming a library, the arrangement of which he himself superintended. But the final subversion of the eastern empire, and the capture of Constantinople in 1453, dispersed the literati of Greece over western Europe, and placed the literary remains of that capital at the mercy of the conqueror. The imperial library, however, was preserved by the express command of Mohammed, and continued, it is said, to be kept in some apartments of the Seraglio; but whether it was sacrificed in a fit of devotion by Amurath IV. as is commonly supposed, or whether it was suffered to fall into decay from ignorance and neglect, it is now certain that the library of the Sultan contains only Turkish and Arabic writings, and not one Greek or Latin manuscript of any importance.

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[1] "Qui primus *bibliothecam dicando*, ingenio hominum rem publicam fecit. (Plin. *Hist. Nat.* lib. xxxv. c. 2.) Ovid also ascribes this honour to Pollio. (*Tristia*, lib. iii. el. 1.)

[2] Plutarch, *in Marcello;* Suet. *de Illust. Gram.* c. 41; Idem *in August.* c. 29; Lipsius *de Biblioth.* c. 7; Pitiscus, *Lexicon*, tom. i. p. 276; Brucker, *Hist. Crit. Philosoph.* tom. i. p. 20.

[3] Suet. *in Tiber.* c. 74, et *in Vespas.* c. 9; Aul. Gell lib. xvi. c. 8; Lipsius *de Biblioth.* c. 20; Suet. *in Domitian.* c. 20.

[4] *Encyclopédie*, tom. ii. art. *Bibliothèque;* Euseb. *in Commodo;* Capitolinus, *in Vit. Gordiani Junioris*, c. 18; Donatus, *Roma Vetus*, lib. iii. c. 8, p. 119.

[5] Hartwell Horne, *Introduction to the Study of Bibliography*, vol. i. p. xv. et seq.

Upon the whole, it appears that books were abundant, both at Rome and at Constantinople, and that learned men in those cities had at their command greater resources than might at first be supposed. Some idea of the quantity of books accessible to persons of study and research may be formed from the great number of references and citations to be found in the works of some authors, particularly in those of Strabo, Pliny, and some others.

II.—LIBRARIES OF THE MIDDLE AGES.

General epithets and figurative expressions frequently convey a meaning which is calculated to mislead. Hearing constantly of "the dark ages," "the period of intellectual night," and "the season of winter in the history of man," we are apt to imagine that, during the time thus designated, the human mind was utterly palsied, and all learning extinct. But in fact, throughout that period, reason, though misdirected, was not asleep; philosophy was rather bewildered than inert; and learning was immured, but not lost. In no part of that long period which extends from the reign of the Emperor Justinian, when Greek and Roman literature everywhere lay open to the light of day, to the fall of Constantinople and the revival of learning in the fifteenth century, do we entirely lose the traces even of the classic authors, much less of sacred literature; for in each intervening age, and in every quarter of Europe, there were writers whose works, being still extant, afford abundant evidence of their acquaintance with most of the principal authors of more remote times.[1] When the empire of the west sunk under the overwhelming pressure of barbarian invasion, those institutions which had been founded and nurtured in the midst of civilization, were, no doubt, swept away by the torrent which desolated Italy, and spread its ravages over all parts of the empire. But learning, though expelled from her ancient establishments, and forced from her favourite haunts, found a safe asylum in the monasteries, which, amidst all the violence and anarchy that reigned without, remained in undisturbed tranquillity, respected even by the barbarians who had overthrown an empire.

Libraries of the Middle Ages.

It is doubtless true that little comparatively is recorded of the libraries of those ages which intervened between the fall of the Roman empire and the revival of letters in Europe about the middle of the fifteenth century. But, as we shall immediately have occasion to show, every age produced learned and inquisitive men, by whom books were highly prized, and industriously collected. Cassiodorus, minister of Theodore, king of the Goths, retired to a monastery which he had built, and there founded a library for the use of the monks, about the middle of the sixth century. At a later period, Charlemagne, distinguished as a patron of learning, instituted, near Lyons, a library, which, according to the statements of historians, contained books bound in a magnificent manner. After this the monasteries almost exclusively possessed libraries, which were increased by the accessions of centuries; and had the zeal of religious reformation been as little destructive to learning as the invasions of the northern barbarians, numberless monuments of ancient learning which are now irrecoverably lost might have been in the hands of every scholar.

Monasteries; system of transcription pursued therein.

The monastic institutions seemed as if framed for the special purpose of transmitting the remains of ancient literature, sacred and profane, through a period in which, except for so extraordinary a provision, they must inevitably have perished. Though there were considerable diversities in the rules and practices of the different orders of monks, the elements of the monastic life were in all orders and in every country the same; and, generally speaking, wherever there was a monastery there was also a manufacture of books. The transcription of ancient works, the only mode in which, anterior to the invention of printing, they could be multiplied and preserved, was a favourite employment among the inmates of these peaceful retreats; and an opinion of meritoriousness attached to the labour, served to animate the diligence, and to encourage the perseverance, of the labourer.[2] If in some monasteries the monks employed themselves in transcribing nothing but missals, legends, and romances, others enriched their libraries with splendid copies of the works of the fathers of the church, and of the Holy Scriptures; and not a few laboured to reproduce such of the classical authors as they were acquainted with or could obtain access to. This system of transcription, to which alone we are indebted for all that remains of ancient learning, was carried on to an extent of which those who are unacquainted with the history of the middle ages can form no conception. We have already had occasion to advert to the occupation of the inmates of the monastic establishments on Mount Athos, the lofty promontory which stretches from the Macedonian coast far into the Ægean Sea; and we have also noticed the immense number of manuscripts which have at different times issued from these establishments. Many manuscripts still extant prove that the copying of books was likewise practised to a great extent during the middle ages, in the monasteries of the Morea, and in those of Eubœa (Negropont), and of Crete (Candia). The latter island seems indeed to have been a place of refuge for learned men during the disastrous period which preceded the fall of the eastern empire; in its monasteries they found an asylum and the means of subsistence. In Calabria and the kingdom of Naples, fifty religious establishments have been mentioned, from which proceeded a large number of the books afterwards collected in the libraries of Rome, Florence, Venice, and Milan.[3] In the monasteries of western Europe, also, especially in those of the British islands, the same system of transcription was carried on. Books were multiplied, and, by their multiplication, preserved, whilst the knowledge of their contents was extended. In a word, it is mainly to the labours of these establishments, that we are indebted for the remains of the classic authors, and the preservation of the sacred books, which they so carefully transcribed.

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[1] Taylor, *History of the Transmission of Ancient Books to Modern Times*, pp. 86, 87.

[2] "This book, copied by M. N. for the benefit of his soul, was finished in the year 948; may the Lord think upon him!" Such is the subscription of many of the manuscripts of the middle ages; and to us, we confess, there is something almost affecting in its pious simplicity.

[3] Taylor, *History of the Transmission of Ancient Books*, p. 83.

Libraries of the Middle Ages.

State of knowledge.

Under the impression produced by certain loose modes of speaking in relation to the deep and universal ignorance which is said to have prevailed in Europe during seven centuries, the existence of a large number of manuscripts of the classical authors, executed during those very ages, presents a great apparent difficulty. From what motive, it may be asked, or for whose use, were these works transcribed so frequently as to be found in all parts of Europe on the revival of learning? Was this an employment which ignorance would have selected, or which ignorance could have encouraged and promoted? A rapid survey of those ages of darkness, as they are called, will to some extent furnish a solution of the difficulty, by proving that, during these times of general intellectual lethargy, there were not a few individuals who cultivated letters with ardour, and to whom the preservation of books was a matter of the most lively interest. The names which we are about to mention bear but a small proportion to the total number which might be produced, it being sufficient for our purpose to refer to one or two writers in each century; but brief as our exposition must necessarily be, it will nevertheless serve to show that learning was not then completely abandoned to neglect and oblivion.

Sixth and seventh centuries.

The sixth century abounds with writers in all departments of literature, many of whose works, having descended to modern times, afford evidence of the undiminished diffusion of general learning. Amongst these may be mentioned Procopius, the historian; Agathias, his continuator; Boethius, author of the *Consolation of Philosophy;* Hesychius, the lexicographer; Proclus, a Platonic philosopher; Fulgentius and Cassiodorus, ecclesiastical writers; Priscian, the grammarian; Gildas, an Anglo-Saxon historian; Evagrius Scholasticus, an ecclesiastical historian; Simplicius, the commentator of Aristotle and Epictetus; Ammianus Marcellinus, a critic and historian whose works contain very copious references to ancient literature; and Stephen of Byzantium, a grammarian and geographer. The seventh century produced fewer writers than perhaps any other period of equal extent within the compass of history. The only names deserving to be mentioned are those of Theophylact of Simocatta, who wrote a history of the Emperor Mauritius; and Isidore, an ecclesiastical writer.

Eighth century.

In the latter part of the seventh and beginning of the eighth century flourished the Venerable Bede, whose writings afford a proof of the general diffusion of books of all classes in that age. Bede displays extensive if not profound learning, the whole of which he had acquired from the sources ordinarily accessible to monastic students. He was a poet, a rhetorician, an arithmetician, a chronologist, a geographer, a philosopher, and an historian;[1] he was versed in the profane authors, says Bale, beyond any man of that age, and derived his physics and general learning, not from turbid streams, but from pure fountains, that is, from the principal Greek and Latin authors. Even during his life, and whilst he still continued to write, his works were, by the ordinance of the British bishops, appointed to be read in the churches.[2] Alcuin, a disciple of Bede, contributed much, by his learning, and his influence at the court of Charlemagne,[3] to assist that enlightened prince in his endeavours to effect the restoration of literature. He was skilled in the Latin, Greek, and Hebrew languages; he gave lectures in all the sciences; he founded many public schools; and his works, historical and theological, which are still in part extant, justify the reputation he enjoyed.[4]

Ninth tury.

Raban Maurus, a disciple of Alcuin, taught theology, philosophy, poetry, and rhetoric, at Paris, in the school established there by the Anglo-Saxon monks. According to Trithemius, he was well versed in the Holy Scriptures, and thoroughly learned in profane literature. He enriched the monastery of Fulda, on the Rhine, with a large collection of books; founded a school there; and trained in every branch of learning two hundred and seventy monks belonging to the establishment. He was created archbishop of Mayence in 847, and died in 856. One of the first professors in the university of Oxford was John Scot, a man of considerable acquirements. He afterwards went to France, where he translated some Greek authors into Latin, but so literally that his versions were almost unintelligible. His writings display various learning; but they were condemned as heretical by the church, on account of his opinions relative to the eucharist. Being forced to leave France, he took refuge in an English monastery, which, however, afforded him no asylum. At the instigation of the monks, he was, like Cassianus, killed by his scholars, with their iron styles. Contemporary with Scot was Photius, with whom no author of that, or of several succeeding ages, can be compared. Educated for secular employments, and for some time engaged in the service of Michael III., he was by that emperor forcibly invested with the dignity of patriarch of Constantinople (856), in the room of Ignatius; and, that he might pass regularly to this office, he was made monk, reader, sub-deacon, deacon, priest, and patriarch, all in the course of six days. From the office thus violently thrust upon him he was expelled by Basilius, the successor of Michael; but, at the head of a band of soldiers, he repossessed himself of the patriarchate, of which, however, he was at length finally deprived, by similar means, and upon this retired to a monastery, where he ended his days. Before his elevation he had composed the *Myriobiblion,* which, in the form of criticisms, analyses, and extracts, contains accounts of more than two hundred and seventy works, exhibits numerous valuable fragments from authors whose works have perished, and affords important aid in ascertaining the genuineness of many remains of ancient literature.

Tenth tury.

Though of the existing manuscripts so large a number were executed in the tenth century, as to prove that, in the reproduction of books, great activity prevailed in that age, yet it presents the names of but few authors whose works have descended to modern times. Eutychius, patriarch of Alexandria, wrote an universal history which is still extant, and, though crowded with fabulous narratives, displays considerable learning.

Eleven centur

The eleventh century is much richer in distinguished names. Avicenna, an Arabian physician, reduced the science of medicine to a systematic form, including almost every thing that had been written on the subject by his predecessors, and was, besides, well versed in Greek literature. Michael Psellus, a Greek physician, wrote upon subjects of all kinds, and was celebrated for the extent of his acquirements both in sacred and in profane

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[1] Sixtus Sennensis, a learned Italian of the sixteenth century, quoted by Blount, in his *Censura Celebriorum Authorum.*

[2] When it is remembered that Bede passed his life in a remote monastery (St Peter and St Paul, on the Tyne, in the diocese of Durham), his various learning is at least a proof that the means of acquiring it were within his reach.

[3] Charlemagne laboured zealously to restore learning both in the church and out of it. He invited learned men to his court, employed them in making Latin translations of the Greek classics and the Fathers; founded public schools; and introduced regulations for making a certain degree of education indispensable to all who held office in the church. Muratori, speaking of the exertions of this prince, is also loud in praise of Great Britain and Ireland, "which, in the study of the liberal arts," says he, "surpassed all other nations of the West in those times." "Nor," he adds, "must we omit to record the diligence of the monks of those countries, who raised and maintained the glory of letters which everywhere else was languishing or fallen."

[4] Alcuin, in his letters, quotes familiarly Virgil, Ovid, and Horace.

Libraries of the Middle Ages.

learning. Lanfranco, an Italian, created archbishop of Canterbury by William the Norman, promoted learning amongst the clergy, and was esteemed accomplished in the literature of his age. Anselm, the disciple and successor of Lanfranco, was also in repute for general learning. The works of Suidas, like those of Photius, contain a treasure of various learning upon points of criticism and literary history; whilst his lexicon, besides the definitions of words, includes accounts of ancient authors, and quotations from works which have since perished. Sigibert, a monk of Brabant, has left a chronicle of events from the year 381 to his own time, and a work containing lives of illustrious men; he was, besides, profoundly versed in the Scriptures, and inferior to none of his countrymen in general learning.

The name of Anna Comnena distinguishes the early portion of the twelfth century. She wrote a history of the reign of her father, the Emperor Alexius Comnenus; a work which displays a masculine understanding, and an extensive acquaintance with literature and the sciences. During this century England produced several eminent writers, particularly William of Malmesbury, Geoffrey of Monmouth, Joseph of Exeter,[1] and, somewhat later, Langton, archbishop of Canterbury, esteemed the most learned man of western Europe in those times. Eustathius, archbishop of Thessalonica, flourished towards the close of the twelfth century. His commentaries on Homer, besides serving to elucidate the Greek language by important criticisms, contain innumerable references to the Greek classics, and thus furnish the means of ascertaining the integrity and genuineness of the text of those authors, as it has descended to our times. John and Isaac Tzetzes, critics and grammarians of Constantinople, are still consulted as commentators upon some of the Greek authors.

Robert Grostest, or Greathead, bishop of Lincoln, was celebrated for his skill in the Latin, Greek, and Hebrew languages, as well as for the bold resistance he offered to the exactions of the supreme pontiff.[2] Matthew Paris, the English historian, displays in his works an acquaintance with ancient learning, and a familiar knowledge of the antiquities of his native country. He vigorously opposed the papal usurpations in England; and his reputation for learning and virtue enabled him to effect a considerable reformation in many of the English monasteries. He died in the year 1259. The works of Albert, surnamed the Great, a Dominican friar, and afterwards (in 1260) bishop of Ratisbon, fill twenty-one volumes, forming a sort of encyclopædia of the learning and science of the age. Like Roger Bacon, Albert of Ratisbon incurred amongst his contemporaries the suspicion of dealing in magic. Learning, in the more restricted sense of the term, that is, the knowledge of books, was too common to excite wonder or envy; but science, or a knowledge of nature, acquired by experimental investigation, was so rare, that it seldom failed to engender both, and to occasion perilous accusations of a correspondence with infernal agents.

The revival of learning is usually reckoned to have commenced in the fifteenth century; but even in the fourteenth a decided advancement in almost every department of literature is discernible. Gross and degrading ignorance was wearing away from the bulk of the community in several parts of Europe; the educated classes were acquiring a better taste and more expanded views; and a general awakening of the energies of the human mind was perceptible. This needs no other evidence than is afforded by the works of Dante, Petrarch, Boccacio, Chaucer, and Gower, which were not merely produced in that period, but extensively read and admired. During no part of that long tract of time which extends from the decline of learning in the sixth century till its revival in the fifteenth, had there been a total extinction of the knowledge of ancient literature; and those inestimable treasures which the religious houses had saved from the ravages of revolution, anarchy, and barbarism, now began to be drawn forth and studied. The continuance of the eastern empire till the middle of the fifteenth century, afforded an uninterrupted protection to Greek learning during those periods when western Europe was laid waste by the Gothic nations; and hence, on the revival of letters, the study of the Greek authors first engaged the attention of those individuals whom an awakening impulse now directed to the cultivation of learning. But that of the kindred authors of Rome soon followed; and the monuments of ancient wisdom and genius which had been preserved in the monasteries, furnished ample materials for laying the foundations of a new and more extensive, if not more perfect, edifice of civilization.

Revival of learning.

More than half a century before the taking of Constantinople by the Turks, the learned men of the imperial city, apprehending the approaching ruin of the empire, began to emigrate into Italy, where they opened schools, and became the preceptors of princes, as well as the guides of the public taste, which they directed towards the study of the classical writers of Greece and Rome. The fall of Constantinople, in 1453, filled the Italian cities with these learned strangers. At this period the Italians required only to receive some kind of direction, and to be provided with the means of study. They had for some time been placed in those peculiar circumstances which have almost always proved favourable to the advancement of the human mind. A number of independent states were crowded upon a narrow space, throughout which the same language, diversified by dialects, prevailed, exhibiting, in a sort of reflected or secondary form, that of ancient Italy. The energy, rivalry, and munificence which accompany commerce, kept the whole mass of society in movement; whilst the influence of a religion, which seeks to recommend itself by every embellishment that the genius of man can devise or execute, overruled the debasing tendency of successful trade, and directed the ambition of princely merchants towards objects more refined and intellectual than those which wealth usually selects as the means of distinction.

Formation of libraries.

The formation of libraries, suggested or favoured by the importation of manuscripts from Constantinople, proved the means not only of making more widely known the works of the Greek authors (which had never fallen into oblivion), but of prompting those researches which issued in the recovery of the Latin writers, many of whom had long been forgotten. The appetite for books being thus revived and quickened, neither labour nor expense was spared in accumulating them; learned men were despatched in all directions throughout Europe, Western Asia, and Africa, to collect manuscripts; and, in the course of a few years, most of the authors now known were brought together in the libraries of Rome, Naples, Venice, Florence, Vienna, and Paris. Aided by the munificence of princes and popes, the scholars of the fifteenth century applied themselves to the discovery, restoration, and publication of the remains of Greek and Roman literature; and, in the course of sixty or eighty years, most of the works now known were committed to the press. Since that time additional discoveries have been made; but the principal improvements of a subsequent date have consisted in the emendation of the text of ancient authors, partly by a more extensive collation of manuscripts than the first editors possessed the means of instituting, and partly also by the lights and aids of a cautious and judicious criticism.[1]

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[1] Author of two Latin poems, one on the Trojan war, and another on the war of Antioch, or the Crusade.

[2] Camden says of Greathead, " he was versed in the languages, and in general literature, in a degree scarcely credible, when the age in which he lived is considered; a terrible reprover of the pope, the adviser of his king [Henry III.], and a lover of truth."

Invention of printing.

The invention of printing, by virtually exempting books from the operation of the law which subjects all human things to decay, has also greatly promoted the process of their renovation. By giving to the issue of an edition of a standard work a degree of importance several hundred times greater than that which belonged to the transcription of a single copy, it has called for a proportionally larger amount of learning, diligence, and caution, in the work of revision; and, by enabling each successive editor to avail himself of the labours of his predecessors, all the advantages resulting from the concentration of many minds upon the same subject have further been secured. Since the fifteenth century, therefore, the lapse of time, instead of gradually impairing and corrupting the literary remains of antiquity, has incessantly contributed to their renovation; what was then unknown or doubtful, imperfect or corrupted, has been ascertained, restored, and completed; and the learning and industry of the four centuries which have since elapsed, being constantly directed towards the same object, have left but few questions of literary antiquity open to controversy. Books are no longer liable to the hazard of extinction from political changes or the decline of learning in this or that country. Unless an universal devastation should overtake every region of the civilized world, the body of learning and science now extant can neither perish nor suffer corruption. And thus it is that the written records of distant ages, as well as the products of modern genius, industry, and research, are secured from extinction by a mode of conservation less liable to extensive hazard than any other that can be imagined.[2]

III.—MODERN LIBRARIES.

Louis Jacob, a Carmelite who wrote on the subject of libraries about the middle of the seventeenth century, enumerates above eleven hundred collections of books, ancient and modern.[3] Many of these were no doubt contained in monasteries, which have since been suppressed, and others did not perhaps possess sufficient consequence to merit specification; but still the numerical amount of them must satisfy the reader as to the impracticability of attempting to comprise, in an article like the present, a complete list, much less a detailed description, of such collections. All that we propose, therefore, under this head, is to extract from the materials before us such particulars as, when thrown together in a condensed form, may serve to convey an accurate idea of the general character, contents, and classification of the principal modern libraries of Europe; and, with this view, as well as for convenient reference, we shall arrange them under their respective heads of *British Libraries*, and *Foreign Libraries*.

British Libraries.

The principal libraries in Great Britain are those of the British Museum and other institutions in London, Lambeth, Oxford, Cambridge, and Althorp, in England; the Advocates', Writers', and College Libraries, Edinburgh, and those of the universities of St Andrews, Glasgow, and Aberdeen, in Scotland; and, lastly, that of Trinity College, in the capital of Ireland.

Library the Britis Museum.

The library of the British Museum, which is now considered as the great national depository of science, literature, art, and antiquities, has been composed of various collections successively obtained, and is chiefly remarkable for its numerous and valuable manuscript acquisitions.

The *department of printed books* consisted originally of the libraries of Sir Hans Sloane and Major Edwards, which were acquired about the middle of last century. In 1757, George II., by an instrument under the great seal, added the library of the kings of England, the printed books of which had been collected from the time of Henry VII., and the manuscripts from a much earlier date. This collection was very rich in the prevailing literature of different periods; and it included, amongst others, the libraries of Archbishop Cranmer, of Henry prince of Wales, and of Isaac Casaubon. His majesty annexed to his gift the privilege which the royal library had acquired in the reign of Queen Anne, of being supplied with a copy of every publication entered at Stationers' Hall. The same department was further enriched, in 1763, by a donation from George III. of a collection of pamphlets and periodical papers published in England between 1640 and 1660, and chiefly illustrative of the civil wars in the time of Charles I., by whom the collection was commenced.

It would be vain to attempt a detailed enumeration of all the additions which have since been made, whether by gift or by purchase. Amongst the smaller acquisitions may be mentioned Dr Thomas Birch's library; two collections of books on musical science from Sir John Hawkins, and one from Dr Charles Burney; Garrick's collection of old English plays; numerous classics from the library of Mr Thomas Tyrwhitt, with his manuscript notes; Sir William Musgrave's collection of biography; a collection of classics, enriched with Dr Bentley's manuscript notes; a library of ceremonials, processions, and heraldry, from Mrs Sophia Sarah Banks; and a collection of Italian history and topography, from Sir Richard Colt Hoare. Amongst the larger and more important are, the general library collected by the Rev. Clayton Mordaunt Cracherode; the law library of Mr Francis Hargrave; the library of science which belonged to the Baron de Moll of Munich; the libraries of M. Guinguené, author of the *Histoire Littéraire d'Italie*, and of the Rev. Dr Charles Burney; and Sir Joseph Banks's library of natural history. Four separate collections of tracts, illustrative of the revolutionary history of France, have been purchased at different times by the trustees, in the exercise of the powers with which they are invested. One of these was the collection formed by the last president of the parliament of Bretagne, at the commencement of the revolution; two others extended generally throughout the whole revolutionary period; and the fourth consisted of a collection of tracts published during the reign of the hundred days in 1815; forming altogether a body of materials for the history of the revolution as complete in regard to France as the collection of pamphlets and tracts already mentioned is with respect to that of the civil wars of England in the time of Charles I. Another feature of the Museum Library is its progressive collection of newspapers from the appearance of the first of these publications in 1588. Sir Hans Sloane had formed a great collection for his day. But to this was added, in 1818, the Burney collection, purchased at the estimated value of L.1000; and since that period the commissioners of stamps have continued periodically to forward to the Museum, copies of all newspapers deposited by the publishers in their office.

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[1] Taylor, *Hist. of the Transm. of Ancient Books*, p. 106. "This restoration," continues Mr Taylor, "of the remains of ancient works to their pristine integrity, has not been effected like that of a dilapidated building or mutilated statue, by the addition of new materials in an imagined conformity with the plan and taste of the original work, but by the industrious collection and replacement of the very particles of which it first consisted."

[2] Taylor, *History of the Transm. of Ancient Books*, p. 108.

[3] See *Traité des plus belles Bibliothèques*, passim.

In 1823, the Royal Library collected by George III. was presented to the British nation by his successor, George IV., and ordered by parliament to be added to the library of the British Museum, but to be kept for ever separate from the other books in that institution. The general plan of its formation appears to have been determined on by George III. soon after his accession to the throne; and the first extensive purchase made for it was that of the library of Mr Joseph Smith, British consul at Venice, in 1762, for which his majesty paid about L.10,000. In 1768, Mr (afterwards Sir Frederick) Barnard, the librarian, was despatched to the Continent by his majesty; and, as the Jesuits' houses were then being suppressed, and their libraries sold, throughout Europe, he was enabled to purchase, upon the most advantageous terms, a great number of valuable books, including some very remarkable rarities,[1] in France, in Italy, and in Germany. Under the judicious directions of Mr Barnard, the entire collection was formed and arranged; it was fed, during a period of sixty years, by an annual expenditure of about L.2000; and it is in itself perhaps one of the most complete libraries of its extent that was ever formed. It contains selections of the rarest kind, particularly of scarce books which appeared in the first ages of the art of printing; it is rich in early editions of the classics, in books from the press of Caxton, in English history, and in Italian, French, and Spanish literature; and there is likewise a very extensive collection of geography and topography, and of the transactions of learned academies. The number of books in this library is 65,250,[2] exclusively of a very numerous assortment of pamphlets; and it appears to have cost, in direct outlay, about L.130,000, but is estimated as worth at least L.200,000.[3] When the King's Library was added to that which previously belonged to the Museum, the number of duplicate volumes in the two collections was found to be about 21,000 volumes, of which the committee of the House of Commons recommended that not more than 12,000 should be disposed of; and hence, by the gift of George IV., a clear addition was made to the national library of between 40,000 and 50,000 volumes.

The aggregate of the collections here enumerated, augmented annually by gifts, by claims under the copyright acts, and by grants of money from parliament, have now placed the department of printed books in the British Museum upon a respectable footing; though, in point of extent at least, it is still far inferior to the principal libraries of the Continent, particularly those of Berlin, Göttingen, Dresden, Naples, Vienna, Copenhagen, St Petersburg, Munich, and Paris.[4] The number of printed volumes in the library, officially returned to parliament, is 220,000, not 240,000, as stated by Sir Henry Ellis, in his evidence;[5] and nearly L.2000 is expended annually in the purchase of old and of foreign publications. In the department of recent continental literature, numerous deficiencies have been pointed out by Mr Edwards, especially in German literature, in French history, in philosophy and legislation, and in the belles-lettres;[6] deficiencies which, it is to be hoped, will ere long be supplied. According to Sir Henry Ellis, however, "the Museum Library is not decidedly poor in any class."

The nucleus of the *department of manuscripts*, at the establishment of the British Museum, was formed by the Harleian, the Sloane, and the Cottonian collections. The next addition made to this department was that of the manuscripts of the ancient royal library of England, conferred by George II. in 1757. In this last collection, which contains the acquisitions of our kings from the time of Richard II. to the date of the grant by George II., there are a number of valuable manuscripts. Of these, one of the most remarkable is the *Codex Alexandrinus*, a present from Cyril, patriarch of Constantinople, to King Charles I. It is in four quarto volumes, written upon fine vellum, probably between the fourth and sixth centuries, and is believed to be the most ancient manuscript of the Greek Bible now extant, in uncial characters. Many of the other manuscripts came into the royal collection at the time when the monastic institutions of Britain were destroyed; and some of them still retain upon their spare leaves the honest and hearty anathemas which the donors denounced against those who should alienate or remove the respective volumes from the places in which they had been originally deposited. This collection abounds in old scholastic divinity, and possesses many volumes, embellished by the most expert illuminators of different countries, in a succession of periods down to the sixteenth century. In it are also preserved an assemblage of the domestic music-books of Henry VIII., and the Basilicon Doron of James I. in his own handwriting. The *Cottonian* collection, which was purchased for the use of the public in 1701, and annexed by statute to the British Museum in 1753, is especially rich in historical documents

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[1] Amongst these may be mentioned the Florence Homer of 1488, which formerly brought L.120, but was purchased by Sir Frederick Barnard for 10s.

[2] Sir Henry Ellis, in his evidence before the Select Committee on the British Museum (*Minutes*, 500), states the number loosely at 75,000 volumes; but, in this estimate, every tract in the library is probably considered as a separate volume.

[3] Report of the Select Committee of the House of Commons on the Royal Library, 18th April 1823.

[4] So far from it being true, as stated by Sir Henry Ellis, that "there are few libraries abroad which equal the Museum Library in extent," Mr Edwards has shown (*Letter to Benjamin Hawes, Esq. M.P.* p. 34, et seq.) that there are at least nine which exceed it, some of them greatly; and several others of nearly equal extent, as those of Wolfenbuttel (190,000), Stuttgard (197,000), Madrid (200,000), &c. The extent respectively of the nine libraries which exceed that of the British Museum is thus stated by Mr Edwards:—

	Vols. of Printed Books.	Vols. of MSS.	Population.
Berlin	250,000	5,000	248,816
Göttingen	300,000	5,000	9,594
Dresden	300,000	2,700	69,000
Naples	300,000	6,000	354,000
Vienna	350,000	16,000	320,000
Copenhagen	400,000	20,000	109,000
St Petersburg	400,000	16,000	320,000
Munich	500,000	16,000	95,718
Paris	700,000	80,000	1,528,301
London, British Museum	220,000	22,500	

Nor is the extent of some of these great libraries their only recommendation; what they possess being well selected, and admirably arranged. (See Russell's *Tour in Germany*, vol. i. p. 252, Edinb. 1828.)

[5] Report, *Minutes of Evidence*, 2419.

[6] See his *Letter to Benjamin Hawes, Esq. M.P.*, containing "Strictures on the *Minutes of Evidence* taken before the Select Committee on the British Museum," pp. 19, 20, 21, 22, 23.

from the time of the Saxons to that of James I. It likewise contains the numerous registers of English monasteries; the charters of Edgar and of Henry I. to Hyde Abbey, near Winchester, written in gold letters; and the manuscript called the *Durham Book*, being a copy of the Latin Gospels, with an interlinear Saxon gloss, written about the year 800, illuminated in the most elaborate style of the Anglo-Saxons, and believed to have once belonged to the Venerable Bede. This collection is also rich in royal and other original letters, and comprises the correspondence of most of the great personages, not only of this country, but throughout Europe, from the earliest periods at which letters were written until the commencement of the seventeenth century. The *Harleian* collection is still more miscellaneous, though historical literature in all its branches forms one of its principal features. It is particularly rich in heraldic and genealogical manuscripts, in the visitations of counties, and in English topographical collections; in parliamentary and legal proceedings; in originals, copies, and calendars of ancient records; in abbey registers; in manuscripts of the classics, amongst which is one of the earliest known of the Odyssey of Homer; in missals, antiphonars, and other service-books of the Catholic church; and in ancient English poetry. It possesses two very early copies of the Latin Gospels, written in gold letters; and also contains a large number of splendidly illuminated manuscripts, besides an extensive mass of correspondence. It further includes about three hundred manuscript bibles or biblical books, in Hebrew, Chaldaic, Greek, Arabic, and Latin; nearly two hundred volumes of writings of the fathers of the church; and works on the arts and sciences, amongst which is a tract on the steam-engine, with plans, diagrams, and calculations by Sir Samuel Morland. The *Sloane* collection consists principally of manuscripts on natural history, voyages and travels, on the arts, and especially on medicine. It comprises the chief of Kæmpfer's manuscripts, with the voluminous medical collections of Mayerne, including the annals of his practice at the court of England from 1611 to 1649; and it also contains a collection of medical and other scientific correspondence, with numerous manuscripts on history, poetry, and miscellaneous subjects. Some of the drawings of animals in this collection are exceedingly rich and accurate; two volumes upon vellum are from the pencil of Madame Merian; and one relates entirely to the insects of Surinam.

In 1807, the collection of manuscripts formed by the first Marquis of Lansdowne was added to these libraries, having been purchased by parliament for L.4925. It consists in part of the Burghley and Cæsar papers, supplementary to the Cottonian collection, but principally of a large assemblage of Bishop Kennett's manuscripts, and numerous collections of an historical kind.[1] Another large collection of manuscripts, almost exclusively belonging to the faculty of the law, was purchased in 1813, of the representatives of Mr Francis Hargrave. Amongst these, besides numerous copies of early reports, is an abridgment of equity in forty-three volumes, by Sir Thomas Sewell, master of the rolls. A collection of manuscripts, chiefly of the Greek and Latin classics, which had been formed at a vast expense by the Rev. Dr Charles Burney, was purchased in 1818. Amongst these is the Townley Homer, a manuscript of the Iliad, similar to that of the Odyssey in the Harleian collection;[2] two early manuscripts of the Greek rhetoricians; a volume of the mathematical tracts of Pappus; and a Greek manuscript of Ptolemy's Geography, adorned with maps of the fifteenth century. Two oriental collections have also been added. One of these, made by Mr C. J. Rich whilst British consul at Bagdad, and purchased by parliament in 1825, contains, amongst other rare manuscripts, several copies of the Syriac version of the Scriptures, which are believed to be of great antiquity. The other, a collection made in different countries of the East, and consisting chiefly of Arabic and Persian manuscripts, was bequeathed to the Museum in the year 1827, by the collector, Mr J. F. Hull. In 1829, a small but valuable collection of manuscripts, partly relating to French history, and partly of a literary character, was bequeathed to the Museum by the Earl of Bridgewater, accompanied by a small real estate, and a sum of L.7000 to be invested, and the interests, as they became available, applied in the purchase of manuscripts. The last distinct collection is that of the Howard-Arundel manuscripts, acquired from the Royal Society in 1831, partly by exchange, and partly by purchase at an estimated value of L.3560. It consists of more than five hundred volumes, contains many manuscripts of interest in almost every branch of learning, and is rich in materials for the history of our own country and language. The ancient rolls and charters of the Museum, many thousands in number, form another division of the department of manuscripts, with a distinct catalogue. These records and deeds partly belong to the Cottonian, Harleian, and Sloane collections, and partly are accumulated additions, being chiefly illustrative of English history, and of monastic and other property.

These are the larger and separate collections. The Donation Manuscripts, as they are called, consist of smaller collections, which have either been acquired by purchase or are the gifts or bequests of individuals. Amongst these may be specified, Madox's collections for the history of the Exchequer; Rymer's materials for his *Fœdera*, used and unused; Dr Birch's historical and biographical manuscripts; the decisions of the judges upon claims made in the city of London after the great fire of 1666; Sir William Musgrave's obituary; Cole's collections for a history of Cambridge and Cambridgeshire, with materials for an *Athenæ Cantabrigienses;* various Coptic and other ancient manuscripts taken from the French in Egypt; Ducarel's abstracts of the archiepiscopal registers at Lambeth; a long series of calendars of the Originalia Rolls from 1 Henry VIII. to 2 James I.; Sir Andrew Mitchell's diplomatic correspondence with every part of Europe, during his residence at the court of Frederick the Great of Prussia; Sir William Burrell's and Mr William Hayley's joint collections for the history of Sussex; Mrs Banks's manuscripts on heraldry, processions, and archery; Abbot's drawings and descriptions of American insects, in seventeen vols. quarto; Wollay's collections for Derbyshire; Sir Joseph Banks's foreign correspondence; Essex's and Kerrich's collections on Gothic architecture and costumes; the Stepney papers; the papers of the Count de Puisaye, chiefly relating to the Chouan war and the Royalists of La Vendée, from 1793 to 1825, in a hundred and seventeen vols.; the Jermyn collections for a history of Suffolk, in forty-one vols. folio; the materials collected by Archdeacon Coxe, whilst employed in the compilation of his various historical and other works, in two hundred and six vols.; numerous manuscripts, illustrative of Italian history, selected from the collection of the Earl of Guilford; three hundred and ten rolls commonly known as the Chancellor's Rolls, being duplicates of the great rolls of the Pipe, between 9 Henry II. and 17 James I.; the topographical collections of Samuel, and Daniel Lysons, being chiefly materials for the *Magna Britannia* and "Environs of London;" Egyptian Papyri, partly purchased from Mr Salt and others, and partly presented by Mr J. G. Wilkinson; an extensive collection of ancient Irish manuscripts, including one or two copies of the Brehon Laws; and a selection, made at an expense of more than L.2000, from the manuscripts possessed by Mr Richard Heber. The total number of manuscripts in the Museum is about 25,000.[1]

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[1] Amongst the single volumes is a manuscript of Hardyng's Chronicle, a French version of the sacred Scriptures upon vellum, five volumes of Saxon homilies, and a fac-simile of the Vatican Virgil, executed by Bartoli in 1642. To these may be added, a Chinese map, and nearly two hundred drawings, in the first style of eastern art, representing the dresses, customs, and natural history of the interior of China.

[2] This manuscript was purchased by Dr Burney, at the price of six hundred guineas.

The catalogues of the *printed books* are chiefly in two series; first, the printed catalogue of 1812, with manuscript enlargements, now far exceeding in bulk the original, in twenty-two volumes folio; and, secondly, the catalogue of the library of George III. in five volumes imperial folio, with an addendum. There is likewise a catalogue of the geographical and topographical collection attached to the library of George III. printed in one volume folio to match the general catalogue of this library, and also in two volumes 8vo, 1834. All the catalogues are alphabetical; and there is yet no general classed catalogue,[2] although a sum considerably exceeding L.5000 has been paid by parliamentary grants as "expenditure on account of a classed catalogue," and an admirable example of such a work has been furnished in the catalogue of the library belonging to the London Institution.[3] The want of such a catalogue is undeniably a great inconvenience. As are the catalogues of a library, so will be its utility.[4] "What good is the use of a library of more than 200,000 volumes," says Heeren, "if one knows not what it contains, or knows not where that which it does contain is to be found."[5] The catalogues of the *manuscripts* are, 1. That of the manuscripts of the old royal library, by David Casley, 1734, in 4to; 2. That of manuscripts heretofore undescribed, by S. Ayscough, 1782, in two vols. 4to; 3. That of the Cottonian manuscripts, by Joseph Planta, 1802, in folio; 4. That of the Harleian manuscripts, by H. Wanley and R. Nares, 1808, n four vols. folio; 5. That of the Hargrave manuscripts, by H. Ellis, 1818, in 4to; 6. That of the Lansdowne manuscripts, by F. Douce and H. Ellis, 1819, in folio; and, 7. That of the Arundel manuscripts, by J. Forshall, 1834, in folio. Manuscript catalogues of the additions in the departments of printed books and manuscripts to the latest time are kept in the Museum reading-room. There is also a separate manuscript catalogue of the collection of tracts relating to the civil wars in the reign of Charles I.; and a separate catalogue of the Cole manuscripts; besides copies f the catalogue of the Royal Library, printed privately by George IV.

The library of the *Royal Society* is a repository consisting chiefly of books of science and general literature, which may be consulted by all the fellows, and from which books may also be borrowed by them under the egulations prescribed by the statutes; nor have the Society, at any time that is remembered, ever refused to lend ooks or manuscripts to learned men not belonging to their corporation, who had occasion to consult them. The titles of the books presented to the Society have been inserted at the end of the later volumes of their Transactions; they possess no further catalogue. The library of the *Royal Institution* was founded by a few gentlemen, for the immediate use of the subscribers to that establishment; but any person may, upon the recommendation of a patron, always have access to it. This collection contains the best and most useful edition of almost every Greek and Roman classic, with the best translations in English, and some in other modern languages; the class of mathematical science in all its branches is very full, including the best scientific journals, and transactions of learned societies; and the historical department, founded on the collection of Mr Astle, which was purchased by the managers at the formation of the library, is, in its various divisions and subdivisions, exceedingly interesting. A catalogue, methodically arranged, with an alphabetical index of authors, by William Harris, was printed in 1809, in 8vo. The library of the *London Institution* was commenced under the direction of Professor Porson, and has been admirably selected. Next to that of topography, the departments of classical literature, mathematics, and history, are the most amply stocked. It is also rich in bibliography, there being few works absolutely necessary to be consulted by the bibliographical student, which may not be found in this valuable collection. In the "introductory preface" to the methodical catalogue of the library, recently published, there are some judicious remarks as to the importance of classed catalogues. The library of the *Surrey Institution*, though less numerous than either of the two preceding ones, presents a choice collection of the most useful books in the different departments of literature, together with some rare and curious works. The catalogue is systematically arranged, with an alphabetical index of authors.[6]

Modern Libraries.

Lambeth library.

The library of printed books founded by Archbishop Bancroft in the reign of King James I. occupies the four galleries over the cloisters of Lambeth Palace. The number of volumes contained in this library is estimated at upwards of 25,000, many of which are of extreme rarity. In ecclesiastical history and in biblical literature, few collections contain so large a number of scarce and curious editions. The class of English topography is also extensive and valuable. The first catalogue of printed books was drawn up by Bishop Gibson; it was afterwards transcribed in a fair hand by Dr Wilkins, and has been continued by his successors to the present time. The manuscripts, many of which are extremely valuable, are arranged in seven sets or divisions, distinguished as *Codices Lambethiani, Whartoniani, Carewani, Tenisoniani, Gibsoniani, Miscellanei*, and *Suttoniani*. This department, besides being rich in copies of the sacred writings, contains Expositions of the Fathers of the Church; Missals, and Hours of the Holy Virgin; a number of papal bulls; various treatises of Wickliffe; manuscripts relating to the history of France, and other European nations, particularly Spain, Italy, Poland, Germany, and Holland; seventeen volumes in folio of the Shrewsbury correspondence, besides several letters to and from Charles II.; and certain manuscripts on heraldry and genealogy, written or corrected by Lord Burghley. But perhaps the two greatest curiosities in this collection are the ancient French version and exposition of the Apocalypse, ornamented with miniature paintings; and the Latin copy of the Apocalypse, also beautifully illuminated, which is supposed to have been written in the thirteenth century. A catalogue of these manuscript treasures, compiled by the Rev. H. J. Todd, the keeper, was printed in 1812, in one volume folio, at the expense of the Archbishop of Canterbury.[1]

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[1] Through some want of attention and management, the Museum has lost some collections which it might otherwise have obained, particularly that of Mr Richard Gough, who left his books and manuscripts to the Bodleian Library (*Minutes of Evidence*, 467–1474. Appendix to Report, 413.) In regard to the contents of the Museum Library, see the article under that head in the *Penny Cyclopædia*.

[2] Of the library of George III. there is a classed catalogue in manuscript, made by Sir Frederick Barnard, at Buckingham House; but this," says Mr Edwards, "is not in the reading-room."

[3] This catalogue comprehends, first, a synoptical table of the classes; secondly, a plan of the arrangement, in classes, of the books hemselves; thirdly, a general classed catalogue of all the books; fourthly, an index of authors' names and works; and, fifthly, an ndex of anonymous works, and of many different subjects of which some account is to be found in the library." As to foreign classl catalogues, it is only necessary to mention two examples; first, that of the library of Göttingen, prepared by the celebrated Heyne; and, secondly, that of St Petersburg, an account of which is given in the appendix to the Report on the British Mueum, p. 464, et seq. But that of the London Institution is allowed to be in several respects superior to either.

[4] Cousin, *Report on Prussian Education*, in which there are some excellent observations on this subject.

[5] *Heyne's Biographisch dargestellt*, von A. H. L. Heeren, Göttingen, 1812, in 8vo.

[6] Hartwell Horne, *Introduction to the Study of Bibliography*, vol. ii. pp. 626, 627.

Oxford libraries.

The different colleges of Oxford and Cambridge have all libraries of various extent attached to them; but in each university there is at least one great or principal library, as the Bodleian Library at Oxford, and that of Trinity College, besides the Public or University Library, at Cambridge.

Bodleian library.

The Bodleian Library, so called from the name of its illustrious founder, was instituted towards the close of the reign of Elizabeth, by Sir Thomas Bodley, who, having become disgusted with some court intrigues, resigned all his employments about the year 1597, and immediately afterwards undertook the generous task of restoring the public library at Oxford, which had been despoiled of its contents in the reign of Edward VI. With this view, he despatched from London a letter to the vice-chancellor, offering not only to restore the building, but to provide a fund for the purchase of books, and the maintenance of proper officers. This offer being thankfully accepted, he commenced his undertaking by presenting to the library a large collection of books purchased on the Continent, and valued at L.10,000. He also collected 1294 rare manuscripts, which were afterwards increased to 6818, independently of 1898 in the Ashmolean Museum. Other collections and contributions were also, by his example and persuasion, presented to the new library. The most important of these, perhaps, was a considerable portion of the very valuable library which had belonged to Jerom Ossorius, the Cicero of Portugal, successively bishop of Sylvas and of Algarve, in which last see he died in 1580. This library having fallen to the share of the Earl of Essex, amongst the booty which had been taken in the expedition against Cadiz in 1598, part of it was by him presented to Bodley, in order to enrich the collection he was then forming. The additions thus made soon swelled to such an amount that the old building was no longer sufficient to contain them. The edifice was accordingly enlarged; and when Bodley had succeeded in enriching his collection beyond his most sanguine expectation, he drew up for its government a body of statutes, which have since been incorporated with those of the university. The Bodleian Library was first opened to the public on the 8th of November 1602; and, since 1780, a fund of more than L.400 a year, arising from a small addition to the matriculation fees, and a moderate annual contribution by such members of the university as are admitted to the use of the library, have been established for the purchase of books. It would require a volume to contain an enumeration of the many important additions which have been made to this library by its numerous benefactors, or to admit even a sketch of its ample contents in almost every branch of literature and science.[2] It is supposed to contain upwards of 160,000 volumes of printed books, and about 30,000 volumes of manuscripts. The oriental manuscripts are the rarest and most beautiful to be found in any European collection; and the first editions of the classics, procured from the Pinelli and Crevenna libraries, rival those at Vienna. In a word, it is exceedingly rich in many departments in which most other libraries are deficient, and it forms altogether one of the noblest collections of which any university can boast; but a complete catalogue of the valuable stores of literature contained in it is still, we regret to say, a desideratum;[3] and, for want of a classed catalogue, the general utility of the collection is materially abridged. The first catalogue of the printed books was published by Dr Hyde in 1674, and another of the manuscripts was printed in 1697. A fuller catalogue of the books, compiled by Bowles, Fisher, and Langford, was printed in 1738, in two volumes folio; but, from the immense increase of the collection since that period, this, as well as the others, has become of little use. A catalogue of the manuscripts relating to oriental history, drawn up by Professor Urie, was printed in 1787, in one volume folio. In 1795, there was also printed a *Notitia* of first, early, or Aldine editions of certain Hebrew, Greek, and Latin works contained in the library, the articles indicated being all of the greatest rarity; and, in 1812, appeared the first part of a catalogue by Professor Gaisford, of the manuscript collection purchased by Dr Edward Daniel Clarke, in his travels through various parts of Europe and Asia. But no complete or general catalogue, either of the printed books or the manuscripts, has yet been published; and for this reason it is impossible to give any specific or satisfactory account of this magnificent collection.

The riches of the Bodleian Library are very imperfectly known to the world, and its stores are increasing faster than they can be catalogued; yet the library is not generally accessible, even to the students of the university; and the arrangements are such, that the very persons engaged in teaching have but a limited use of it. The average number of daily readers is stated to be about half a dozen; whilst, in the British Museum, it is at least one hundred and fifty. The books of the Bodleian Library are not allowed to go out, and, by this restriction, its utility is greatly abridged. The use, to a reasonable extent, of a collection which is certainly one of the best in the world, would of itself form a strong inducement to study at Oxford; and it is inconceivable how this advantage should have been withheld, considering that the terms in which Sir Thomas Bodley made his donation to the university present no obstacle whatever to the lending out of books.[4]

The libraries of the different colleges are many of them considerable, some of them extensive, and not a few of them enriched with much that is both curious and rare. Bishop Rede contributed the first part of the collection of books in Merton College, which has since been augmented, both in manuscripts and in printed books, by the liberality of succeeding benefactors. University College Library possesses a considerable collection of printed books and manuscripts, together with some works of art. Baliol College Library suffered by the depredations of the visitors appointed by Edward VI.; but the damage was afterwards repaired by a supply of books from Durham College, and by successive donations. The library of Queen's College contains some curious manuscripts, chiefly heraldic and political, a valuable series of coins, a collection of numismatical works, and a fine orrery. The books of New College occupy two spacious apartments, and there is also a collection of manuscripts. The library of Lincoln College is chiefly remarkable for a collection of Greek and

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[1] *Repertorium Bibliographicum*, or Some Account of the most celebrated British Libraries, p. 93.

[2] Chalmers, *Hist. of the Colleges, &c. attached to the University of Oxford*, vol. ii. p. 460, et seq. *Repertorium Bibliographicum*, p. 68.

[3] Hartwell Horne, *Introduction to the Study of Bibliography*, vol. ii. p. 629.

[4] *A Few Words on the Bodleian Library, Oxford*, 1833, 8vo. *Journal of Education*, vol. v. p. 288, et seq.

Modern Libraries.

Latin manuscripts made by Sir George Wheler in his travels. That of All-Souls' College is an excellent collection; it was admirably arranged, under the superintendence of Sir William Blackstone; and the greatest facility is consequently afforded in consulting any class. In the library of Brazen-nose College, the ancient custom of chaining the books to the shelves was strictly observed until the year 1780, when this conservative practice was abandoned. This collection is of considerable extent and value. The library of Corpus Christi College is enriched with a valuable set of Aldine classics, with many manuscripts and printed books, of great rarity and in excellent preservation, and with the manuscripts of Twyne and Fulman, the Oxford antiquarians. The Aldines were collected by the founder, Richard Fox. In 1755, Lord Coleraine gave to this library a large and valuable collection of Italian literature. The library of Christ Church would probably have exceeded that of any contemporary establishment, had Wolsey been able to complete his original design, which was, not only to supply it with such books as had appeared since the invention of printing, but also with copies of the most valuable manuscripts in the Vatican. This collection is principally composed of the extensive and valuable library bequeathed by the Earl of Orrery, amounting to 10,000 volumes; of that left to the college by Wake archbishop of Canterbury, consisting of printed books and manuscripts, with a collection of coins and medals; and of the contributions of a number of benefactors. In 1767, the numismatical series was further enriched by the collection of British and English coins belonging to Dr Barton, and, in 1780, by that of oriental coins collected by Dr R. Brown, canon and regius professor of Hebrew. The library of Trinity College was instituted by the founder, Sir Thomas Pope, who was also the first contributor of books. The collection was afterwards enlarged by various benefactions, and is now one of considerable extent. The library of St John's College contains a valuable collection of printed books and manuscripts given by Archbishop Laud; many specimens of natural and artificial curiosities, and relics of antiquity; with a collection of Greek, Roman, and English coins, bequeathed by Dr Rawlinson, along with his books. In the library of Wadham College are many early printed books, and a good collection of classics and works on theology, together with French, Italian, and Spanish literature. The library of Worcester College is a considerable collection, and particularly rich in architectural books and manuscripts. The Radcliffe Library, so called from the munificent founder, Dr Radcliffe, who left L.40,000 for the erection of a public library in Oxford, with an endowment of L.150 a year to a librarian, and L.100 for the purchase of books, is an extensive and valuable collection, and contains some valuable but neglected manuscripts.[1]

The library of Trinity College, Cambridge, is extensive, and contained in a very magnificent structure built by Sir Christopher Wren, being two hundred feet in length, forty in breadth, and thirty-eight in height. The collection is separated into thirty classes, distributed in cases of oak; and the books are both numerous and valuable. Amongst other literary curiosities, there are some interesting manuscripts in the handwriting of Milton. They are contained in a thin folio volume, which was discovered by Professor Mason amongst the papers of Sir Henry Puckering, and consist of the original copy of the Masque of Comus; several plans of Paradise Lost, composed at the period when he intended to have made that subject the groundwork of a tragedy; and the poems of Lycidas, Arcades, and several others. Here are also the Arabic manuscripts left by Dr Gale, and the collection relating to English antiquities by his son Dr Roger Gale; Sir Isaac Newton's copy of his *Principia*, with his manuscript notes, and his letters to Roger Coles; and the voluminous Shakspeare manuscripts and printed books of Edward Capell, a catalogue of which was printed by Mr Steevens.[2]

The University or Public Library of Cambridge is extensive, and contains much that is valuable or curious both in the department of printed books, and in that of manuscripts. The printed books comprise a fine series of *editiones principes* of the classics, and a very considerable proportion of the productions of Caxton's press. The most important acquisition made by this library was that of the collection which had belonged to Dr Moore, bishop of Ely, amounting to 30,000 volumes, which were munificently purchased for six thousand guineas by his majesty King George I., who presented them to the library, and further gave L.2000 towards fitting up the apartments destined for their reception. Bishop Moore's collection, which is singularly rich in the productions of the early English printers, was offered to the Earl of Oxford for L.6000, and on his refusal was purchased and presented as has just been mentioned. A method of arranging the books in the public library of Cambridge was long ago proposed by Dr Middleton, but no catalogue of them has yet been printed. The number of volumes in this library must now considerably exceed 100,000. Amongst the manuscripts contained in it are, 1. the celebrated manuscript of the four Gospels and Acts of the Apostles, known by the name of the *Codex Bezæ*, which was presented to the university by that distinguished reformer; 2. *Magna Charta*, written on vellum; 3. several very valuable manuscripts purchased at the sale of Dr Askew's collection; 4. some curious Syrian manuscripts presented by the Rev. Dr Buchanan;[3] 5. a Coptic manuscript written upon long narrow papyrus, with an ancient stylus; and, 6. a Koran upon cotton paper, superbly executed.

The library of Bene't College contains a number of manuscripts. Those which were collected after the dissolution of the monasteries relate to the writings of the fathers, school divinity, the reformation, civil and ecclesiastical affairs, and the concerns of various religious houses; and many of them are in the old Saxon character. St John's College Library contains one of the most valuable and extensive collections of books in the University, particularly in biblical and classical literature, and is also enriched with some first editions which came originally from the Harleian collection. The Pepysian Library, Magdalen College, is so called from the founder, Samuel Pepys, secretary to the admiralty in the reigns of Charles II. and James II. who bequeathed to this college his valuable library, together with his prints and drawings. It is remarkable for a collection of old English ballads, in five volumes folio, begun by Mr Selden, and continued to the year 1700; and two volumes of Scottish poetry, consisting of pieces by Gawin Douglas, Dunbar, Lindsay, Drummond, James I. and other poets. Dr Percy, in his *Reliques*, has made a judicious selection from the former; and, in 1776, Mr Pinkerton published copious extracts from the latter. Pepys's collection of prints and drawings, illustrative of the history of London, and his rare British portraits, are particularly valuable.[1]

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[1] The state in which William Augustus Schlegel found a manuscript fragment of the *Ramayana* in the Radcliffe Library, shows that the condition of oriental manuscripts in England is not satisfactory, and that things least used are not always best cared for. The following is his own account of the matter:—"We commenced a diligent search; at last we drew forth from a press which had long been unvisited, the separate and torn portions of manuscripts, covered with dust and dirt, and leaves rolled up together promiscuously. Oh, what destruction did I then see! Nothing was ever scattered more confusedly from the Sybil's cave into every quarter of the heavens, when the leaves on which she used to write her oracles were carried away by a sudden storm. I was not able to examine them all, for I was in haste to return home, it being late in the autumn. I selected, however, from the midst of that disgraceful confusion, a fragment of the *Ramayana*, and I put together almost the entire manuscript of the poem '*de Crishni ἐπιφανεια* (*Srî Bhâragavata-Purâna*)' and I re-arranged as many of the leaves as I could find, in their order. I had already noticed the unusual antiquity of the writing, and I read with no small astonishment these dates at the end of the books, 'Samvat, 1461–1463,' A. D. 1405–1407. The most ancient in the King's Library at Paris is a manuscript of the same poem, which was written sixty-five years after, 'Samvat, 1528, A. D. 1472.' The university of Oxford, therefore, although still ignorant of its wealth, possesses a manuscript which is most rare, and indeed unique in Sanscrit literature." This statement requires no comment. (*Journal of Education*, vol. i. pp. 403, 404.)

Early in the present century, a public infirmary, and an astronomical observatory, now amply supplied with astronomical instruments, were erected from the funds still in the hands of Dr Radcliffe's trustees.

[2] *Repertorium Bibliographicum*, p. 110.

[3] See Chalmers's *History of the Colleges, &c. of Oxford*, passim; also *Athenæ Oxonienses*, Bliss's edition.

Earl Spencer's library.

The library of Earl Spencer, at Althorp, Nottinghamshire, though a private collection, is eminently deserving of notice here, not so much by reason of its extent, which is very considerable, as on account of the unrivalled treasures which it contains in several departments of literature, sacred as well as profane. This library, amounting to not less than 45,000 volumes, exclusively of the Cassano collection purchased in 1820, was entirely formed by the late Earl Spencer, within a period of time not exceeding twenty-four years; and it is unquestionably the richest private collection in Britain, perhaps in Europe.[2] The foundation of the department of books printed in the fifteenth, and of valuable first editions published in the sixteenth century, was laid by the purchase of the collection of Count Reviczky, a foreign nobleman who had occupied himself in accumulating rare and curious works of a peculiar description. But many scarce and valuable impressions of the classical authors were afterwards obtained; and in the departments of literature and the belles-lettres it was enriched with some magnificent acquisitions. Impressions of Bibles and Testaments, and of portions of the sacred text in almost all languages, are to be found in this extraordinary collection; the departments of classical literature, in the Greek, Latin, and Italian languages, are of equal, if not greater extent and value; whilst the choice, condition, and splendour of the entire collection are such as render it quite unique and unrivalled.[3] But, perhaps, its most remarkable feature is the unexampled assemblage to be found in it of works illustrating the origin and progress of typography. It contains several books, consisting of impressions taken from carved wooden blocks previously to the invention of metallic types, and thus exhibiting the earliest specimens of stereotype printing. In others, engraved figures constitute the principal part, to which is added a small proportion of text, and only one side of the leaf is employed, the other being left blank. Such is the *Ars Memorandi Notabilis per Figuras*, supposed to have been thrown off previous to the year 1430, and consisting of a number of rude cuts of the principal events recorded in the Gospels, with text on the opposite page; and such, also, is the *Ars Moriendi*, the subject of which is a sick man in bed, surrounded by grotesque and hideous figures of angels and demons. The taste of the time inclined to the monstrous or the absurd. In the former work St Luke is represented by a bull standing on his hind legs, whilst St Mark is depicted as a rampant lion. The *Historia Veteris et Novi Testamenti seu Biblia Pauperum*, also in this collection, is supposed to have been executed prior to the year 1450, and is by some considered as the earliest specimen of block-printing. Amongst the early printed and scarce bibles in the Althorp Library, may be mentioned the Mazarin Bible, printed between 1450 and 1455; one supposed to be the work of Albert Pfister, prior to 1460; Fust and Schœffer's Bible, 1462; that by Sweyheym and Pannartz, 1471; a Dutch Bible, 1477; Prince Radzivil's Bible in Polish; besides other early copies in the different languages of Europe. The same collection contains the Latin Psalter of Fust and Schœffer, printed in 1457, being the first printed to which a date is affixed; and another of nearly equal rarity, printed in 1459. Many of the earliest editions of the classics, beautiful copies on vellum, and the works of all the celebrated printers of the fifteenth century, add to the value of this unrivalled collection. The Cassano Library,[4] purchased by Earl Spencer in the year 1820, and soon afterwards united with his general collection, formed a valuable addition to the Althorp Library. Amongst other rarities, it contained the famous edition of Horace, printed at Naples in 1474, by Arnoldus de Bruxella, of which there is no other known copy; that of Terence, printed by Riessinger, without date, but probably not later than 1471; the earlier productions of the Neapolitan press; rare editions of the early Italian classics; specimens of early printing at Rome, including the edition of Juvenal by Ulric Han; together with all the rare editions of Virgil, Horace, Ovid, and other Roman poets.[5]

Advocates' library.

We come now to Scottish libraries, and shall commence with the largest as well as richest of the number; that of the Faculty of Advocates. The plan of forming a library appears to have been adopted by the Faculty as early as the year 1680. The author and active promoter of the scheme was Sir George Mackenzie of Rosehaugh. It was originally intended that it should consist merely of the works of lawyers, and of such other books as were calculated to advance the study of jurisprudence. This may be inferred from the inaugural address delivered by Sir George Mackenzie when the library was first opened, and from several other papers relative to the subject. At its commencement, this library had no certain fund allotted for its maintenance. It depended upon and owed its increase to the donations of benefactors, together with such sums as the Faculty from time to time placed at the disposal of the curators. In the year 1700, the apartment where the library was kept being nearly destroyed by fire, it was removed to the place which it partly still occupies, namely, the ground floor of the Parliament House. During the nine years immediately following, it must have increased considerably,[6] since by the act passed in the eighth year of Queen Anne's reign, the privilege of receiving a copy of every book entered at Stationers' Hall was conferred upon it, alongst with eight other libraries, four of which were Scotch, being those attached to the universities of St Andrews, Glasgow, Aberdeen, and Edinburgh.

The department of printed books comprehends, in a greater or less degree, almost every branch of science, philosophy, jurisprudence, literature, and the arts. As might be expected, the collection of law-books is extensive; but it is much more complete in ancient than in modern works, many important treatises on foreign jurisprudence being still wanting. The historical collection, which is exceedingly valuable, contains almost every work of consequence that has been published in Great Britain, France, Italy, Spain, Portugal, Denmark, and Sweden. This department alone comprehends upwards of 20,000 volumes. The collection of Greek and Roman classics, though it cannot vie with some others, is also choice and extensive, including several first and many early editions. The library is rich in modern poetry and belles-lettres, and, besides the miscellaneous department, contains a very considerable collection of voyages and travels. It is defective in the great branch of mathematical and physical science; in archæology or antiquities; in early as well as modern Italian literature; and, generally, in foreign literature of a recent date. Amongst the separate collections are, the Astorga library, the Thorkelin collection, and that of old Scottish books. A collection of Spanish books, amounting to about 3400 volumes, which had formerly belonged to the library of the Marquis of Astorga, was purchased from a London bookseller in 1824, for the sum of L.3000. It consists principally of works on Spanish history, including the old chronicles, as well as of books on law and theology, with a sprinkling of the old Spanish poems and romances. The Thorkelin collection, so called from Professor Thorkelin, to whom it originally belonged, contains about 1200 volumes, chiefly on northern law, history, and antiquities. Of the Scottish books, those relating to old Scottish poetry are exceedingly rare and curious. They amount to between three and four hundred volumes, and their number is likely to be still further increased by the zeal and research of the present librarian, Dr Irving, who has already made many important additions to this collection, partly by the acquisition of new articles, and partly by detaching curious pieces from other collections, and putting them in a distinct and more accessible form. His labours in this department, with which he is intimately conversant, have been beyond all praise; and he is constantly on the watch to take advantage of every opportunity that offers for augmenting its treasures. There is also a collection of German dissertations, amounting to upwards of 100,000, called Count Diedrich's collection, which was purchased by Sir William Hamilton, on account of the library, for the trifling sum of L.80. This library is not rich in typographical rarities. It contains few Caxtons, and, with the exception of the Mentz Bible, and some specimens of early printing in Scotland,[1] has but little to interest those who delight in the productions of the press during the infancy of the art. The total number of printed volumes contained in the library does not, it is thought, fall much short of 150,000.

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[1] *Repertorium Bibliographicum*, p. 109, art. *Pepysian Library*, &c.

[2] Dibdin, *Bibliotheca Spenceriana*, preface, London, 1814, in four vols. royal 8vo, with a supplementary volume.

[3] Dibdin, *Œdes Althorpianæ*, vol. i. p. 37.

[4] So called from the Duke di Cassano Serra, a Neapolitan nobleman, by whom it was sold to Earl Spencer.

[5] See Supplement to the *Bibliotheca Spenceriana*, forming vol. v. of that Descriptive Catalogue of the Books printed in the Fifteenth Century, &c. London, 1823.

[6] In 1707, the library received a large donation of books in natural history, to which many of the most costly and magnificent works on that branch of science have since been added.

The department of manuscripts, though not so extensive as in some other libraries of the same class, is nevertheless of great interest and value with reference to the civil, and particularly the ecclesiastical history of Scotland. Soon after the foundation of the library, the Faculty appear to have turned their attention to the collection of manuscripts; and this important department now consists of nearly 1700 volumes, of which about 250 have been added within the last fifteen years. The most valuable portion of the manuscripts is that which relates to the ecclesiastical state of Scotland immediately preceding the era of the Reformation, and includes, amongst other things, thirteen chartularies or volumes of records of the different religious houses, which escaped the general destruction in which the edifices themselves were then involved. Considerable light is also thrown on the civil and ecclesiastical history of Scotland at a later period, by the documents and other materials contained in the collections of Sir James Balfour, Sir Robert Sibbald, and Wodrow the historian. Balfour's collection, which consists of upwards of sixty volumes, was purchased at a considerable expense in 1698. About the half of it consists of original state papers, and several very curious royal letters written in the times of James VI. and Charles I. From these, selections were made by Lord Hailes, and printed in 1762 and 1765. The Annals of Scotland, compiled by Sir James Balfour, were also printed in 1824, 1825, in four volumes 8vo. But there still remain unprinted some manuscripts on genealogy and heraldry, besides a considerable number of curious documents. Sir Robert Sibbald's collection, consisting of upwards of thirty volumes, was purchased by the Faculty in 1723. It is chiefly of a topographical and literary character; but the substance of the greater part relating to topography has already been published. Wodrow's collection is by far the most voluminous, consisting of upwards of 160 volumes. It was chiefly from this immense mass of materials that that laborious writer compiled his History of the Sufferings of the Church of Scotland; but by far the greater portion of the collection, containing many curious original documents not to be met with elsewhere, is still unprinted. His correspondence with many eminent literary characters, embracing a period of more than thirty years (from 1694 to 1726), and extending to about thirty volumes, is also full of curious information respecting the literature and history of the period to which it refers. A collection of original documents belonging to the reigns of James V., Queen Mary, and James VI., was presented to the library by the Earl of Balcarras in the year 1712; these papers have lately been arranged and bound, and now consist of nine volumes folio. This department also contains Lord Fountainhall's collections, in his own handwriting, including his decisions, historical notices, diary, and other matters. We may likewise notice the curious and interesting papers of Paton, Murray, Anderson, and Hutton, all of which have recently been arranged and bound in several folio and quarto volumes; and also those collected by Mr Scott of Perth, consisting of about twenty volumes folio, and comprising the Blackfriars charters, in three volumes, extracts from the records of the Church of Perth, in four volumes, the records of the Hospital from 1577 to 1732, extracts from the records of the Kirk-session, a chronicle, and a register of baptisms and deaths. Amongst the Scottish historical records are, letters from James V., and the Earl of Arran, governor of the kingdom in the infancy of Queen Mary, to the kings of England, France, Norway, and Portugal, to the Duke of Guise, the Earl of Suffolk, and others, from 1539 to 1542: also original letters by Queen Mary, addressed to her mother the queen-dowager, during the early years of that beautiful but ill-fated princess; by Anne of Denmark, queen of James VI.; by Prince Henry and Prince Charles, his sons; by the Princess Elizabeth, his daughter; and by the Elector Palatine and his son to James VI., entirely of a familiar nature.

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[1] The first production of the Scottish press preserved in this library should not pass unnoticed. It is a breviary composed by the bishop of Aberdeen for the use of his cathedral, and printed in the year 1509; and it consists of two volumes in small octavo, but of the first volume the title-page and some leaves at the end are wanting. The second volume, printed in 1510, has at the beginning a calendar, and at the end these words: "Opido Edinburgensi impresso jussu et impensis honorabilis viri Walteri Chepman ejusdem opidi Mercatoris quarto die Junii milesimo CCCCC decimo." On the outside of this leaf is a wooden engraving representing a man and woman clothed in skins of beasts, with their shoulders bare, and their heads adorned with wreaths of flowers; whilst between them stands a tree, from which is suspended a shield with W. C. in cipher.

The same department includes a number of manuscripts on heraldry, genealogy, and Scottish law, besides many of a miscellaneous nature. It also contains several early manuscripts of the classics, and a few illuminated missals. Amongst the former may be mentioned a very fine copy of Horace, belonging to the thirteenth century; the plays of Terence, executed in the year 1436; a copy of the Epigrams of Martial, in perfect preservation, which, from the style of the writing, has been ascribed to the ninth century, and is supposed to be one of the most ancient manuscripts of the Epigrams extant;[1] a copy of Valerius Maximus, beautifully written on vellum, dated 1398; Lactantius *De Opificio Dei*, a gem of its kind; the mathematical collections of Pappus of Alexandria, written in beautiful Greek, with admirably-executed diagrams; besides portions of several classics, as Cicero, Ovid, Juvenal, and Persius, all of considerable antiquity. A manuscript copy of St Jerome's translation of the Bible, supposed to have been written about the tenth century, and said to have been found in the Abbey Church of Dunfermline during the reign of David I.; the Auchinleck manuscript, from which Sir Walter Scott printed the Romance of Sir Tristrem; and Bannatyne's manuscript, in two volumes folio, being a collection of ancient poems made by different learned Scotchmen, lovers of antique song, and "written by Geo. Bannatyne in the time of his youth, 1568;"[2] likewise adorn this department of the library. It was from the Bannatyne collection that Allan Ramsay selected the poems which were printed in the Evergreen; and from the same source Lord Hailes extracted a volume, which was printed in the year 1770. In 1825, about a hundred volumes of Icelandic manuscripts, amongst which are several ancient Sagas, were purchased of Professor Magnuson of Copenhagen, and added to the collection; and in the following year, Mr Elphinstone, and Mr Erskine, formerly of Bombay, presented to the library some valuable Persian and Sanscrit manuscripts. Not long ago a beautiful manuscript of the Hebrew Bible was purchased in Germany; it is in two large folio volumes; and the Pentateuch, besides the original, has also the Chaldaic paraphrase. A manuscript of the *Corpus Juris Civilis*, well executed, but of uncertain date and doubtful authority, and, in several respects, exceedingly defective, was likewise purchased several years ago.

The building which contains the bulk of the Advocates' Library is not only confined, but is in several parts exceedingly dark and inconvenient. The historical department, however, has been separated from the rest of the collection, and arranged in a spacious and elegant apartment, with convenient side-rooms, recently provided for its reception, being intended to form the grand entrance to a large building which it is proposed to erect for the reception of the great body of the library, as soon as the necessary funds can be obtained. The library is governed by five curators, one of whom goes out of office annually by rotation, and another is elected in his stead from amongst the body of the Faculty. Under the curators are a principal keeper or librarian, and several assistants. The library is supported partly by the acquisitions which it is continually making in virtue of the right conferred upon it by the copy-right act, and partly by an annual sum paid to the curators for the use of the establishment out of the revenue of the Faculty. No public institution in Great Britain, or perhaps in Europe, is conducted with greater liberality than the Advocates' Library. Strangers arriving in Edinburgh are freely admitted without introduction; and any one who is at all known is never denied the privilege of resorting to, and of reading or writing in, the library. Very eminent men have been keepers of this collection, particularly Thomas Ruddiman, David Hume, and Adam Ferguson. The present librarian, Dr Irving, well known by his Life of Buchanan and other works, is a distinguished scholar, a learned civilian, and eminently skilled in ancient Scottish history, biography, and poetry.

The first volume of the general catalogue was begun in 1735, and printed in 1742, under the superintendence of the learned Ruddiman and Mr Walter Goodall; the second, consisting of later acquisitions, was compiled by Mr Alexander Brown; and this was followed by a third volume, printed in 1807, all in folio; but the manuscript additions which have since been made are at least equal to other two printed volumes of the same size. There are manuscript catalogues of the Astorga and Thorkelin collections; but as yet there exists no separate catalogue of the manuscripts. A catalogue of the law-books was printed in 1831, in one volume 8vo. There is no classed catalogue of the Advocates' Library, nor even a classed index to the general catalogue, which would be a great convenience to those engaged in scientific or literary pursuits.

Library of the Writers to the Signet.

The library of the Writers to his Majesty's Signet is an excellent and valuable miscellaneous collection of books in science, law, history, geography, statistics, antiquities, literature, and the arts; and it has recently been rendered much more accessible by the ample and spacious accommodation provided for it. It is contained in two large and beautiful apartments, both under the same roof, with small rooms adjoining. The accommodation altogether is perhaps superior to that of any library in Britain. The books are arranged in classes or departments, not in conformity to any particular bibliographical system, but with reference simply to the nature and extent of the collection, and the circumstances necessary to be attended to in placing it in the particular apartments which it occupies. The arrangement, however, is such as to afford facilities for reference, and to exhibit, in a general way, the component parts or branches of the collection. The upper apartment, in which about 14,000 volumes have already been placed, contains the following classes, viz. theology and ecclesiastical history; general and particular history, biography, and antiquities; arts and sciences; transactions of learned societies, encyclopædias, and dictionaries; polygraphy, or the collected works of authors who have treated on various subjects; classics, translations, and works illustrative of the classics; and, lastly, belles-lettres and miscellaneous literature in the learned as well as in foreign languages. The lower apartment, and the adjoining small rooms, contain the classes of civil, Scottish, English, and foreign law; British and Irish history, biography, antiquities, topography, and statistics, with all works relating to these heads; geography, voyages and travels; bibliography; belles-lettres, in the English language, and the miscellaneous productions of British literature; besides collections of periodical publications, parliamentary reports, and parliamentary debates, with a collection of maps suspended in spring cases. The class comprising works relating to the history, biography, antiquities, topography, and statistics of the British empire, forms the most extensive department of this collection, and is, in fact, nearly complete in most of its subdivisions. The choice and condition of the books generally, and the rarity, value, and splendour of many, deserve particular notice; and, indeed, this library, though supported exclusively from the funds of the Society to which it belongs, possesses some of the noblest and most expensive works ever published, either abroad or at home. The number of volumes may be estimated at nearly 50,000. There is a classed catalogue, formed on De Bure's system, and very skilfully executed, which was printed in the year 1805; but this applies only to a small portion of the collection, which has been very greatly increased since the catalogue in question was prepared. An alphabetical catalogue of the whole collection has been printed, in progressive parts; and to this there is now (1836) in the Press, a *classed index*, which will, in a great measure, supply all the advantages of a catalogue raisonné. The government of the library is vested in a body of curators, elected by the Society; and under them are a principal librarian and several assistants. Here, as is the case of the Advocates' Library, the utmost liberality is shown to strangers, and to literary men generally.

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[1] An account of this manuscript was published by Mr Dalyell in 1811, in 8vo, two copies of which were printed on vellum.

[2] Bannatyne's manuscript was presented to the library, in the year 1772, by the Earl of Hyndford.

Like most other college libraries, that of the University of Edinburgh was founded by a donation; and, for a long period, the casual contributions of benefactors constituted its principal means of support as well as of increase. In 1580, Mr Clement Little, commissary in Edinburgh, bequeathed his library, consisting of about 300 volumes, chiefly theological, to Edinburgh and the Kirk of God; and this small collection was, not long afterwards, transferred by the Town Council to the College, which they were then instituting. Little's bequest thus laid the foundation of the University Library. But it was subsequently augmented, partly by the donations of citizens, and still more by the benefactions of persons who had received their education in the College. Amongst the latter may be mentioned, Dr Robert Johnston, the Rev. James Nairne, and, above all, Drummond of Hawthornden, one of the favourite sons of the Scottish muse. Drummond bequeathed to the College his whole library, consisting of about 500 volumes; and the gift is the more valuable, because, independently of the high reputation of the donor, the collection is enriched with many rare specimens of our early literature, and may indeed be considered as altogether unique and unrivalled. In 1763, the library of the incorporation of surgeons was added to that of the College, in consequence of an agreement, which has eventually proved eminently advantageous to the former body, whatever may be the case in as far as regards the interests of the University. This collection consisted of about 500 volumes, almost entirely professional, and now of very little value. The principal bequest which the library has more recently received is that of Dr William Thomson, who, in 1808, left it about 600 volumes, chiefly on medical subjects. In a testamentary bequest by the late General Reid, who was educated at this university, mention is made of the library, as an object to the improvement and extension of which, his munificent legacy is, amongst other things, to be applied. The funds by which the library is maintained, and its progressive enlargement secured, are, matriculation fees, fees on graduation in three faculties, a donation of L.5 from each professor on his induction, an annual payment of L.20 by the College of Surgeons, occasional donations of books, and its acquisitions as one of the privileged libraries; but from the sums thus realized are of course to be deducted the salaries of the persons employed in the establishment. The ordinary management of the library is vested in nine curators appointed annually by the Senatus Academicus, four of whom retire from office every year, and are immediately succeeded by an equal number of professors next in seniority, who are willing to undertake the duty. Four of these curators are from the medical, one from the theological, and four from the general department, including classes neither medical nor theological.[1] This library consists of about 90,000 printed volumes, including some great typographical rarities; and the accommodation now provided for it is of the most magnificent description, the library-hall being by far the most spacious and noble apartment in Scotland. As to the collection generally, it contains much that is valuable, and a good deal that is both curious and rare; but, considered as a repository of varied information in science and literature, it is unequal and defective, being redundant in some branches and deficient in others. Its most ample department is that of medicine, a purely professional one, and more largely replenished than any other with obsolete matter. Those of natural philosophy and natural history are tolerably supplied with the works belonging to them. But the case is different in the departments of metaphysical, ethical, and political science, in all of which the deficiencies are still great, though, happily, in the way of being gradually supplied. In classical literature, too, including under that head all that relates to the exposition and illustration of the ancient authors, there are perhaps few great libraries more defective.[2] It is to be hoped, however, that every exertion will be made, not only to supply obvious and glaring deficiencies, but also to give to the collection that character of generality, founded upon the possession of all that is most useful and interesting in every branch of knowledge, which constitutes the best recommendation of a great public library. This it is which has imparted to the library of Göttingen its great and acknowledged excellence. The only catalogue yet printed is one of the books relating to medicine, arranged alphabetically according to the names of the authors.[3] In addition to the public, there is attached to the university a theological library, founded towards the close of the seventeenth century, and now containing about 5000 volumes.

Glasgow University library.

The history of the library of Glasgow College, though curious and interesting, is chiefly a register of the numerous successive donations by which it was gradually formed. Amongst the names of its early benefactors we find that of George Buchanan, who, it appears, presented to the college twenty volumes, consisting entirely of Greek works, chiefly classics,[4] and made other benefactions, the extent of which cannot now be ascertained. This library is said to contain upwards of 30,000 volumes; and the funds for its support are derived from the interest of certain small sums bequeathed by individuals, from graduation fees, and from the contributions of students, including the interest accruing from the deposit money. It also enjoys the privilege of receiving books from Stationers' Hall.[5] Amongst the manuscripts in this library are several volumes by Wodrow, principally on biography. A catalogue of the printed books, by Professor Arthur,[6] appeared in 1791, and, we presume, is the one still chiefly consulted, though considerable additions must have been made since it was printed.

St Andrews University library.

There was very early a library in each of the colleges at St Andrews; but no mention is made of an university library until about the commencement of the seventeenth century. At that period, there occurs a notice of such a collection; and a catalogue of its contents, made at the time, is still extant, the books being chiefly presents from James VI. and the members of his family. With this public university library, those of St Salvator's and St Mary's Colleges came, in process of time, to be incorporated; and, rather more than half a century ago, that of St Leonard's College, the best of the collections, was conjoined with the rest. As now constituted, the library is supported by the interest of money made up out of the excess of the receipts above the expenditure of its funds, the surplus rent of some teinds and lands held in lease from the exchequer, certain fees on graduations, and an annual payment by every student of the university, exclusively of its right to receive books from Stationers' Hall.[1] It contains about 35,000 printed volumes, and is, upon the whole, an excellent collection. There is a printed catalogue to the year 1826, and a progressive manuscript one since that time.

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[1] Report of Commissioners on the Universities and Colleges of Scotland, App. p. 167, et seq.

[2] Edin. Evid. p. 648, quoted in the App. to the Report of the Commissioners on the Univ. and Coll. of Scotland, p. 172.

[3] Catalogus librorum ad rem medicam spectantium in Bibliotheca Academiæ Edinburgensis, secundum auctorum nomina dispositus. Editio altera. Edinburgi, 1798, 8vo.

[4] Such as the works of Plutarch, Plato, Demosthenes, Apollonius, Aristophanes; Strabo, and Euclid.

[5] Appendix to Report of Commission, p. 278, et seq.

[6] Catalogus impressorum librorum in Bibliotheca Universitatis Glasguensis, secundum literarum ordinem dispositus. Labore et studio Archibaldi Arthur, A. M. Glasguæ, 1791, 2 vols. folio. Printed by Andrew Foulis.

Libraries of Aberdeen Colleges.

There is reason to believe, that from the first institution of the university of Aberdeen there was a collection of books at King's College, but no particular record of the library or its management, prior to the year 1634, is now to be found. The collection is considerable, containing from 15,000 to 20,000 printed volumes, and a number of manuscripts. Amongst the latter are, a splendid copy of the Koran, said to have belonged to Tippoo Sahib; a work on Hindu theology, written upon fine vellum, and rolled on a piece of ivory like the *volumina* of the ancients; and a Shaster in Sanscrit, written on the leaves of trees. This library is entitled to a copy of every book entered at Stationers' Hall. Its funds, however, are altogether inadequate, not only for the purchase of new, and particularly foreign publications, but even for binding the books obtained from Stationers' Hall, in the way proper for a public library. The library of Marischal College had its origin in a collection of books made at the time of the Reformation by the magistrates of Aberdeen, and partly procured from the suppressed monasteries of that city.[2] The number of volumes in it is about 11,000. The funds for supporting this library arise from fees of graduation, and the interest of a sum of money amounting to rather more than L.900. The principal and professors of Marischal College have a right to the use of the books transmitted from Stationers' Hall, and deposited in the library of King's College.[3]

Library of Trinity College, Dublin.

The library of Trinity College, Dublin, owed its establishment to a very curious incident. In the year 1603, the Spaniards were defeated by the English at the battle of Kinsale. Determined to commemorate their victory by some permanent monument, the soldiers collected amongst themselves the sum of L.1800, which they agreed to apply in the purchase of books for a public library, to be founded in the then infant institution of Trinity College. This sum was placed in the hands of the celebrated Usher, who immediately proceeded to London, and there purchased the books necessary for the purpose. It is a curious coincidence, that Usher, whilst occupied in purchasing these books, met in London Sir Thomas Bodley, engaged in similar business, with a view to the establishment of his famous library at Oxford. From this commencement, the library of Trinity College was at different periods increased by many valuable donations, including that of Usher's own collection, consisting of 10,000 volumes, until at length its growing magnitude requiring a corresponding increase of accommodation, the present library-hall, a magnificent apartment of stately dimensions, was erected in the year 1732. In 1787 the entire collection consisted of 36,047 volumes of printed books, and 1111 volumes of manuscripts and prints. But since that time great additions have been made to the library. When the French invaded Holland in 1794, the collection of Pensionary Fagel, amounting to upwards of 20,000 volumes, was removed to England, where, in 1802, it was purchased by the College for the sum of L.8000, granted for the purpose by the trustees of Erasmus Smith.[4] Another important addition was made to the original collection by the acquisition of the valuable classical and Italian books which had belonged to Mr Quin; and, altogether, the library of Trinity College now forms one of the first order, at least in this country. In the department of printed books, the total number of volumes is now supposed to fall little short of 100,000. The Usher manuscripts amount to 693, the Stearne to 135, the Stearne and Alexander to 77, and those presented by other persons to upwards of 200 volumes. Usher's manuscripts may be classed into Bibles, and parts of Bibles, with commentaries; breviaries, missals, Roman rituals, the works of the fathers, and oriental writers; systematic, scholastic, and polemic writers; catalogues, philosophical, medical, and historical; and, lastly, Irish histories and genealogies, civil and ecclesiastical. The subjects of the Stearne manuscripts are somewhat similar to these, with the exception that some of them treat of forensic subjects.[5] In this department of the collection, there is preserved the Gospel of St Matthew, along with other fragments of Scripture, written in Greek capitals, and ascribed by Dr Barrett to the sixth century.

Foreign Libraries.

Having described the principal libraries of Great Britain and Ireland, we shall now proceed to those of foreign countries, and, in particular, endeavour to give some account of the principal collections in France, Spain, Italy, Germany, Poland, Russia, Denmark, and Sweden. This account, however, must necessarily be brief and imperfect; for, owing to the magnitude of the subject, the space we can devote to the whole would scarcely be sufficient for an adequate description of the treasures contained in the Vatican or the Royal Library at Paris.

The libraries of France may be divided into those of the capital, and those of the departments. The principal lib-

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[1] App. to Report, p. 413.

[2] These books were retained in one of the churches, under the care of the magistrates, and were called the Town's Library, and *Bibliotheca Ecclesiastica.* On the 19th of May 1624, Mr Thomas Reid, Latin secretary to James VI., bequeathed his books to the college, and left 6000 merks to the town, the interest of which was to be applied as a salary to a librarian. Reid's collection was afterwards united to the *Bibliotheca Ecclesiastica*, and to the books bequeathed by Dr Liddel, and other benefactors; and the whole, forming one collection, was deposited in the college, of which it now constitutes the public library. (See Appendix to the *Report of Commission on the Universities and Colleges of Scotland*, p. 361.)

[3] App. to Report, p. 361.

[4] The Fagel collection being at first intended for sale by public auction, a classed catalogue by Mr Samuel Paterson was printed in the beginning of 1802. Speaking generally of this collection, in the preface Mr Paterson says, "It is one genuine library, which has been accumulating in the family of Fagel, a name of the first respectability, and which has borne in succession the highest civil offices in the united states of the Netherlands upwards of one hundred and twenty years. It abounds in many of the choicest books in theology and ecclesiastical history, in classical and philological learning, and in most branches of polite literature, arts, and sciences; it includes almost all the great *corpora* of history, antiquities, and diplomatic science; the books of prints, archaiological, numismatical, and topographical (which are very numerous), are commonly of the best impressions: as an historical, geographical, genealogical, and statistical library, it may justly rank among the most distinguished."

[5] Warburton, &c. *History of the City of Dublin*, vol. ii. p. 937, et seq. London, 1818, in 4to. *Repertorium Bibliographicum*, art. *Trinity College Library*, London, 1829, in 8vo.

Modern Libraries. raries of the capital are, the Royal Library, the Mazarin Library, the library of the Arsenal, the library of St Geneviève, the City Library, and the libraries of the Chamber of Peers, the Chamber of Deputies, the Institute, and the University. The libraries of the departments are two hundred and fifty in number, exclusively of those which are specially annexed to learned bodies, to establishments of public utility, to colleges, and other institutions.

Royal library. The Royal Library of Paris is justly considered as the finest in Europe. It was commenced under the reign of King John, who possessed only *ten* volumes, to which 900 were added by Charles V., many of them superbly illuminated by John of Bruges, the best artist in miniatures of that time. Under Francis I. it had increased to 1890 volumes, and under Louis XIII. to 16,746. In 1684 it possessed 50,542 volumes; in 1775 it amounted to 150,000; and by 1790 it had increased to about 200,000. At present it contains about 700,000 printed volumes, and 80,000 manuscripts. In 1667, Louis XIV. having ordered all the medals and curiosities contained in the royal residences to be collected together, caused them to be deposited in the library. Learned antiquarians, sent into foreign countries, augmented this collection; rare and precious objects were successively acquired; and the library at present possesses the richest and most varied collection that exists in Europe. The cabinet of engravings, also founded by Louis XIV., is composed of paintings on vellum, designs, and an immense collection of prints and maps, from the discovery of engraving to the present time. It contains 1,400,000 prints or engravings, and 50,000 maps and charts.

The Royal Library is at present divided into the following departments: viz. 1*st*, printed books; 2*d*, manuscripts, charters, and diplomas; 3*d*, coins, medals, engraved stones, and other antique monuments; 4*th*, engravings, including geographical charts and plans. These four departments form four distinct establishments, which, by their importance and the richness of their treasures, exceed every thing of the kind that is to be found in other countries. It is indispensable that the library should every year make the acquisition either of foreign books or of French works in which it is deficient; and it is equally obliged to purchase manuscripts, prints, charts, and medals. A decree of 1556, which fell into desuetude during the troubles of the Fronde, but was renewed in 1689, imposed on publishers the obligation of furnishing to the Library of the King copies of all works printed by privilege; and each copy required to be bound. At present the law prescribes the deposit of copies of all books printed; but the other condition is dispensed with. In consequence of this privilege, the Royal Library receives annually about 9000 volumes stitched; and the number of foreign books sent to it, or acquired by purchase, may be estimated at from 2000 to 3000 volumes. Now, as the price of the binding of each volume is, on an average, three francs, it follows that a sum amounting to about 36,000 francs, or L.1450, would be necessary, every year, to defray the expense of binding alone. But as the funds have for many years been insufficient to meet the whole of this expense, the library has at present more than 120,000 volumes stitched or in boards, and of these there are about 80,000 which urgently require binding. There are likewise 15,000 manuscripts which either require to be bound, or of which the binding should be renewed.[1]

The additions from the Vatican Library, selected by the French commissioners in 1797, were particularly valuable, amounting to 501 manuscripts. Of these, twenty were Hebrew; forty Syriac; nineteen Coptic; eleven Chinese; 133 Greek, amongst which were the celebrated *Codex Vaticanus* of the Septuagint; 176 Latin, including the famous Virgil of the seventh century, Terence of the tenth, Horace of the eleventh, Cæsar of the twelfth, Plautus of the eleventh, Pliny of the tenth, and Ovid of the twelfth centuries; besides many other manuscripts illustrative of the history of the ninth and tenth centuries. Numerous manuscripts in modern languages were also seized in virtue of the compulsory treaty of Tolentino, particularly the Commedia of Dante, transcribed by Boccacio, the Arcadia of Sannazaro, Michel Angelo's letters, and also those of Henry VIII. and Anne Boleyn; besides 136 early printed books, thirteen Etruscan vases, and 737 ancient coins. To these must further be added the manuscripts collected by the French in other parts of Europe, to which their victorious eagles had penetrated. But the events of 1814 and 1815 were followed by as complete a restitution of the literary treasures as of the works of art acquired by right, or rather by abuse, of conquest. Of the contents of this magnificent, nay matchless collection, it would far exceed our limits to give any details, or even to enumerate the choicest articles. It is rich in every branch and department, unique in some, scarcely surpassed in any, unrivalled in all taken together. Of books printed on vellum, it contains at once the finest and most extensive collection in the world.[2] Excepting on Sundays and holidays, the Royal Library is open daily, from ten until two o'clock; every book is brought that is required; and literary men of known respectability are permitted to take books to their own residences. The annual expense of the establishment is 274,000 francs, or nearly L.11,000 sterling, which is provided for in the budget. The principal librarian is the celebrated Hellenist, M. Letronne, with the title of director-president; the conservators, or keepers, are MM. Van-Praët, Magnin, Champollion-Figeac, Hase, Silvestre de Sacy, Raoul-Rochette, Thevenin, and Jomard, all men of distinguished eminence. The actual administration of the library is conducted in conformity with the principles and rules prescribed in an *Ordonnance du Roi*, dated 26th March 1833.[3]

There is no complete catalogue of this vast collection. That of Labbe, printed in 1653, in 4to, treats of some manuscripts, which are divided into historical and chronological, biblical and theological, epistolary and diplomatic, technical and philological. Anicetti Mellot's catalogue of the manuscripts in the Royal Library was printed at Paris, 1739–1744, in four vols. folio. The first volume contains the oriental manuscripts; the second, the Greek manuscripts; the third and fourth comprise those in the Latin language. The catalogue of the printed books, arranged by Sallier Boudot, in six vols. folio, comes down only to the year 1753. Besides these, there are notices and extracts of the manuscripts in the Royal and National Libraries, Paris, 1787–1804, in seven vols. 4to, and a catalogue of the Sanscrit manuscripts in the former collection, by Hamilton and Langlès, Paris, 1807, 8vo. There is no classed catalogue.[4]

The Mazarin library. This library was founded by Cardinal Mazarin.

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[1] See *Reponses aux Questions adressées au Gouvernement François sur les Bibliothèques*, Appendix to Report on the British Museum, pp. 525, 526.

[2] The number of books printed on vellum, contained in the Royal Library at Paris, amounts to 1467, exclusively of those restored in 1814 and 1815. The total number of books of this sort extant does not exceed 2700. Lord Spencer's collection, which is the richest in this country, contains only 108. (Van-Praët, *Catalogue des Livres imprimés sur Velin de la Bibliothèque du Roi*. Paris, 1822, in six vols. 8vo.)

[3] *Ordonnance du Roi, et Règlement concernant la Bibliothèque Royale, 26 Mars* 1833. Appendix to Report on the British Museum, No. 13, p. 405, et seq.

[4] Le Prince, *Essai Historique sur la Bibliothèque du Roi*, Paris, 1782; Horne, *Introd. to Study of Bibliography*, vol. ii. p. 567, et seq.

formation of it was intrusted to the learned Gabriel Naudé, who, having first selected all that suited his purpose in the booksellers' shops in Paris, travelled into Holland, Italy, Germany, and England, where the letters of recommendation of which he was the bearer enabled him to collect many very rare and curious works. In 1648, this collection consisted of 40,000 volumes, and was already a public library, though that of the king did not become one until 1737. Cardinal Mazarin by his will bequeathed it to the college which he founded, and which, until the epoch of the Revolution, bore the name of the founder. At present it contains 90,000 printed volumes, and 3437 manuscripts. It is remarkable for a great number of collections containing detached pieces, and small treatises, which date as far back as the fifteenth century, and exist nowhere else; nor has any other library so complete a body of the ancient books of law, theology, medicine, and the physical and mathematical sciences. It also possesses a most precious collection of the Lutheran or Protestant authors. In one of the halls are placed models in relief of the Pelasgic monuments of Italy and of Greece; in another is a terrestrial globe, eighteen feet in diameter, formed of plates of copper, and executed by order of Louis XVI. This monument, which is unique in Europe, is unfortunately not finished; a sum of 25,000 francs (L.1000) would be necessary to provide it with the requisite circles. The Mazarin Library is habitually frequented by more than an hundred readers. It is supported by an annual grant of about L.1400, provided for in the budget.[1] M. Petit-Radel is the principal librarian.

Library of the Arsenal

This library, founded by the Marquis de Paulmy, formerly ambassador of France in Poland, was, in 1781, acquired by the Count d'Artois, who conjoined with it nearly the whole of the library of the Duke de Valière. It consists of more than 175,000 volumes, of which about 6000 are manuscripts. It possesses the most complete collection extant of romances, since their origin in modern literature; of theatrical pieces, or dramas, from the epoch of the moralities and mysteries; and of French poetry since the commencement of the sixteenth century. It is less rich in other branches, but it has all works of importance, and, in particular, contains historical collections which are not to be found elsewhere. The library of the Arsenal has always attracted the attention of the learned from all parts of Europe. It is constantly frequented by more than sixty readers, who there apply themselves to scientific and literary researches. The annual grant for its support is 36,000 francs, or L.1440. M. Charles Nodier is principal librarian.[2]

Library of St Geneviève.

The foundation of this library dates as early as the year 1624, when Cardinal de Rochefoucauld, having reformed the Sainte-Geneviève, made it a present of 600 volumes. In 1687, the abbey had already 20,000 printed volumes, and 400 volumes of manuscripts. In 1710, Letellier, archbishop of Paris, bequeathed to it all his books. At the epoch of the Revolution it possessed 90,000 printed volumes and 3000 manuscripts; at present it contains 160,000 volumes and 3500 manuscripts. In it may be found all the academical collections, and a complete set of Aldines; it is particularly rich in historical works; and its most remarkable manuscripts are Greek and oriental. Its typographical collections of the fifteenth century are not more valuable for their number than the high state of preservation in which they are found. This fine library is daily frequented by upwards of two hundred persons, of whom more than a half are students in the different faculties. It is supported by an annual grant from the public treasury of 40,500 francs, or upwards of L.1600. The principal librarian is M. de Lancy.[3]

The City Library contains 50,000 volumes, and is supported by a grant of 7500 francs from the funds of the municipal council. The library of the Chamber of Peers contains 16,000 volumes, and has allotted to it a sum of 10,000 francs for the purchase of books and to defray the expense of binding. The library of the Chamber of Deputies contains 50,000 volumes, and receives annually a sum of 12,000 francs for the same objects. The University Library, which is placed in the buildings of the Sorbonne, consists of 40,000 volumes, and is very useful to the students of the different faculties, who frequent it in the intervals between the lectures or prelections. It expends annually a sum of about 1800 francs.[4]

The foundation of the library of the Institute was the old City Library (*Bibliothèque de la Ville*), which consisted of scarcely 20,000 volumes. At present this excellent and useful collection amounts to nearly 80,000 volumes. It is not yet complete in any department; but it nevertheless exhibits the best possible selection of the principal works in all the important branches of human knowledge; and it may be truly said that it is kept up to the actual state of science and learning. In the acquisitions which are made, the object is not to search for rare editions, but to obtain such as possess some peculiar merit. Academical collections of all kinds and of all countries, magazines and journals of science and literature in all languages, are to be found in it in greater number than any where else. The library increases daily. Numerous works are presented to the Institute, which, on its part, is constantly making new acquisitions; and the premises allotted for its accommodation have become insufficient to contain its accumulations. This collection is reserved for the members of the five academies of which the Institute is composed; but all strangers presented by them are admitted, and it is *de facto* public. As it is open every day during seven hours, the service therein is more severe than in the other libraries, which are only open four hours, and enjoy vacations. The number of books has been quadrupled since the institution of the library, and yet the number of the conservators and assistants remains the same. The annual expense of the establishment, though arranged with the strictest economy, amounts to 46,500 francs, or about L.1860.[5]

The provincial libraries of France, as they are supported at the expense of the different cities, are naturally placed under the immediate direction of the mayors and municipal councils; but they are not the less on that account under the superintendence of the superior authority of the minister of public instruction. Their number, as already stated, exceeds 250, exclusively of those attached to societies, colleges, and other institutions. Amongst the most considerable are those of Bordeaux (115,000), Lyons (100,000), Aix (75,000), Besançon (56,000), Amiens (48,000), Versailles (40,000), Marseilles (35,000), Toulouse (30,000), &c. The catalogue of the manuscripts in the library of Lyons, 1518 in number, is one of the most interesting which has issued from the French press (Paris et Lyon, 1812, in three vols. 8vo). The preliminary disquisition contains notices of the ancient libraries of Lyons; the historical essay on manuscripts contains a neat account of the materials anciently used in writing; the biography of writers who have treated of the subject, though brief, is worthy of attention; and the manuscripts are classed and described with equal judgment and learning.[6]

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[1] *Bibliothèques Royales*, App. to Report, note (M), art. 47, p. 567.

[2] *Ibid.* App. to Report, *ubi supra.*

[3] *Ibid.* App. to Report, *ubi supra.*

[4] *Reponses aux Questions*, &c. in the Appendix to Report, No. 18, p. 526.

[5] *Notes sur le Budget du Ministère de l'Instruction Publique*, chap. vii. Appendix to Report, p. 564.

[6] *Reponses*, &c. App. to Rep. *ubi supra*; Edwards, *Letter to Benjamin Hawes, M. P.* p. 36 (note); Horne, *Introd. to Bibliog.* vol. ii. p. 573.

The number of public libraries in Spain is much greater than has commonly been supposed; nor have the science and literature of that country sunk to such a state of depression as some have been pleased to represent. Few nations, it is true, have ever been doomed to pass through so long and dreary a course of misgovernment; in none have bad laws corruptly administered, and a system of civil polity at variance with every sound principle, done more to cramp the energies and debase the general character of the people. But in spite of the evils which have thus been entailed upon her, Spain is by no means the degraded and benighted country which many have been led to suppose. Her scientific and literary institutions are respectable; several of her establishments are admirable; and some of her collections are unique. The very extravagance and absurdity of her fiscal regulations and expurgatory prohibitions have served to defeat their own operation; and the contrabandistas have ministered to those wants which, under a better and more healthy system, would have been supplied by the regular dealer.[1] This applies to books as well as to other articles; for where there is a demand, no law can prevent the supply, though it may change the direction in which it flows. Hence the quantity of books of every kind in general circulation has at all times been much greater than persons unacquainted with the real state and condition of that country could have imagined. But our business here is with the public and permanent collections of Spain, which are, the Royal Library at Madrid, the library of the Escurial, and the libraries of the provinces.

There are in Madrid four public libraries, which are constantly open from nine in the morning until two in the afternoon, holidays excepted. Of these, the principal is the *Biblioteca Real*, which was, several years ago, removed to a building erected for the purpose in the square beside the palace. This noble collection is open to all, as far at least as the printed books are concerned. The reading-tables are placed in three spacious apartments, corresponding to as many sides of the edifice, which is built round a court, with a fine stair-case in the centre; in the middle of these rooms are rows of tables provided with writing materials and chairs; and against the walls are the book-shelves, numbered and tastefully ornamented. The catalogues are kept in a small room apart, where there are two or three persons in attendance to answer the inquiries of the stranger, and to furnish him with the number and shelf where any particular work may be found. The service of the library is excellent. The principal attendants, ten in number, are respectable literary men, who find here a maintenance, and leisure to follow their different pursuits. The Royal Library contains 200,000 printed volumes, and from 4000 to 5000 manuscripts, amongst which are many valuable Greek, Latin, and Arabic manuscripts, and unedited works, chiefly Spanish. The establishment of the library consists of one principal librarian, D. Joaquin Patiño, six keepers, and the ten attendants already mentioned. The *Monetario*, or cabinet of medals, is arranged in an elegant and beautiful apartment, and contains an unrivalled collection of Celtic, Phœnician, Carthaginian, Greek, Roman, Gothic, Arabic, and modern coins and medals, in excellent preservation. "Le cabinet des médailles de Madrid," says M. Faure, "est sans doute le plus remarquable de l'Europe. Tandis que Paris, qui l'emporte si incontestablement sur la capitale des Espagnes par les monumens des arts et de l'antiquité, n'a que cent mille médailles dans sa collection, il y en a cent quatre-vingt-trois mille dans celle de Madrid: cent cinquante mille sont classées dans l'ordre le plus parfait; trente-trois mille seulement restent à classer. Ces preuves matérielles du passage des Celtes, des Tyriens ou Phéniciens, des Carthaginois, des Romains, des Vandales, des Suèves, des Alains, des Goths, des Maures sur cette malheureuse terre qu'ils se sont arrachée les uns aux autres, réconcile avec les Espagnols, dont on a d'ailleurs tant d'occasions d'accuser l'indifférence. On trouve dans cette collection précieuse de quoi applaudir au zèle de ceux qui l'ont formée et de ceux qui l'entretiennent avec tant de soin."[2] A still more recent traveller, speaking of the *Biblioteca Real*, says, "It is one of *many* institutions which awaken the admiration of the stranger in Spain, as being at variance with the pervading decay."[3] The only catalogue that has been printed is one of the Greek manuscripts, by D. Juan Yriarte (Madrid, 1769, folio); a work rarely to be met with, the king of Spain having reserved the whole impression for presents.

Library of the Escorial.

The convent of the Escorial, situated upon the southern declivity of the Guadarrama chain, about half way up the mountain, owes its existence to a vow made by Philip II. during the crisis of the battle of Saint-Quintin. It derives its name from San Lorenzo del Escorial,[4] to whom it was dedicated, and has been often described. At present we have only to do with the literary treasures contained in this magnificent edifice. In the library of the Escorial there are about 130,000 printed volumes, and between 4000 and 5000 manuscripts, of which 567 are Greek, 67 Hebrew, and 1800 Arabic. The Arabic manuscripts were originally much more numerous;[5] but a large proportion of them was consumed by the fire which, in 1671, destroyed a great part of the library, and all that remains is the number just stated. Besides these, which are extremely curious, there are detached manuscripts of great rarity and value, particularly one of the Four Gospels, written on 160 leaves in gold letters, and supposed to be of the tenth century; a treatise by St Augustin, *De Baptismo Parvulorum*, said to be in his own handwriting; the original works of St Teresa; and a parchment roll containing an original Greek manuscript by St Basil. The books are placed, whimsically enough, with their backs to the wall, so that the edges of the leaves are turned outwards, and the titles of the works written thereon. This was the practice of Arias Montanus, whose library formed the basis of that of the Escorial; and the same absurd method has continued to be followed for the sake of what is called uniformity. The library of the Escorial was founded by Charles V.[6] There is no printed catalogue of the books; and that of the learned Casiri includes only the Arabic manuscripts rescued from the conflagration of 1671, with a few others subsequently acquired. This catalogue, however, is particularly valuable, inasmuch as each manuscript is not only enumerated, but its age and the author's name, when known, are also given, together with occasional extracts both in the original Arabic and in the Latin language.[1]

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[1] Le fisc prélève des droits aux frontières des royaumes de Navarre, d'Aragon, de Castille, de Valence, de Grenade, à cours de l'Ebre, autour de seigneuries de Catalogne et de Biscaye, vers les frontières de Portugal; d'où la cherté des denrées ou marchandises, et les avantages de la contrabande. On *estime à vingt mille hommes l'armée des contrabandiers en Espagne.*" (Mortonval, Conde de Villamayor).

[2] Faure, *Souvenirs du Midi, ou l'Espagne telle qu'elle est*, pp. 43, 44, Paris, 1831, in 8vo.

[3] *A Year in Spain*, vol. i. p. 243, et seq. London, 1831, in 8vo.

[4] *Escorial* is formed from the Spanish word *escoria*, signifying *dross*. It is commonly applied to all places where there are old or exhausted mines.

[5] In a fortress belonging to the emperor of Morocco, there were found 4000 Arabic manuscripts, which were carried to Paris for sale; but not being prized in that capital, they were transported to Madrid, where about 3000, including the most valuable, were selected for the library of the Escorial by order of Philip II.

[6] It is not a little singular, that in the return of the "Public Libraries and Archives of Spain," made to Lord Palmerston by Mr

Provincial libraries.

The number of provincial libraries in Spain is considerable. The more extensive and important are those of Toledo (30,000), Salamanca (24,000, with 1500 MSS.), Santiago University at Coruña (17,307, with forty-one MSS.), and Valladolid (13,000). But at Malaga, Peruel, Seville, Murcia, Lugo, Cervera, Oviedo, Palma, and some other places, not to mention the library of the Asturian Institute, and that of the Junta of Commerce at Coruña,[2] are collections of books varying from 3000 or 4000 to between 9000 and 10,000 volumes each.

Italian libraries.

Italy is rich in literary institutions of all kinds, particularly in noble collections of books and manuscripts. Indeed there is scarcely a city in the whole peninsula without its library; and many of those which are considered as small collections in that country would be differently estimated in most others. It is to be regretted, however, that of some of the larger collections, as for instance the Ambrosian Library at Milan, no adequate account can be given, owing to the inaccessibility of the necessary materials.

Library of the Vatican.

Amongst the libraries of Italy, that of the Vatican, at Rome, stands pre-eminent, not more for its grandeur and magnificence, than for the inestimable treasures with which it is enriched. The origin of this library is attributed by some to Pope Hilarius, who, in the fifth century, founded one in the Lateran Palace. But although it is probable, that, even prior to that period, the Roman church must have possessed a considerable stock of books for the use of its clergy, yet it may be supposed that the pontiffs were too much occupied with the dangers and difficulties of the times, to have either the leisure or the means necessary for the formation of libraries. That a good many volumes, however, had been collected at an early period, seems pretty certain; nor is it less so, that Pope Zacharias considerably augmented their number about the middle of the eighth century. Still Nicholas V., learned himself, and a distinguished patron of letters, is justly considered as the founder of the Vatican Library; for of the collections of his predecessors little remained when he ascended the papal throne, the books having been either lost or destroyed by the frequent removals from Rome to Avignon, and from Avignon to Rome. This pontiff added above 5000 manuscripts to the original collection, placing all in the Vatican; and Calixtus III. is said to have enriched it with many volumes saved from the libraries of Constantinople, when that city fell into the hands of the Ottomans. From this period, it continued to increase in a regular progression, receiving almost every year vast additions, sometimes even of whole libraries, owing not only to the favour of the pontiffs and various princes, but also to the well-directed zeal of its librarians, many of whom have been men of eminent talents as well as of high rank and extensive influence.[3] Under the reign of Pope Urban VIII. a most valuable addition was made by the purchase of the library at Heidelberg, belonging to the Elector Palatine; and those of the Dukes of Urbino, and Christina queen of Sweden, were likewise annexed to the collection in the Vatican. The same pontiff despatched Leo Allatius into Germany for the purpose of selecting the most valuable books to be sent to Rome;[4] and by these acquisitions, conjoined with the liberality of subsequent popes, the Vatican Library became the richest perhaps in the world, at least in manuscripts, before the most valuable of these were conveyed to Paris in the year 1797.

This magnificent library consists of three divisions or compartments, besides the vestibule; the ante-room, the double gallery, and the great saloon or hall. The vestibule contains Chinese works relating to geography and chronology, together with two columns bearing ancient inscriptions. The ante-room is appropriated to the two keepers of the library, and the secretaries, or rather interpreters, seven in number, who can speak the principal languages of Europe, and who attend for the convenience of learned foreigners. In this apartment are also accommodated those engaged in translating from the Hebrew, Arabic, Syriac, Greek, and Latin languages; and it is open daily for the use of students, Thursdays and holidays alone excepted. Passing from the ante-room, the visitant enters a double gallery of two hundred and twenty feet in length, which strangers at first conceive to be the whole library; but at its extremity there opens upon the astonished visitant, in almost interminable perspective, another gallery, which, according to some, exceeds a thousand English feet in length,[5] and forms the great saloon or hall of the Vatican, with various rooms and cabinets annexed. These galleries and apartments, all vaulted and painted with varied effect by painters of different eras and talents, constitute the receptacle of this noble collection. The books are all kept in close cases; and in the Vatican the stranger seeks in vain for that imposing display of volumes which he may have seen and admired in other libraries. The number of these has never been accurately stated; some confine it to 200,000, others raise it to 400,000, and some swell it to more than 800,000,[6] whilst not a few, carrying exaggeration into the other extreme, reduce it as low as 90,000, and even below 50,000, or the number of the manuscripts. This monstrous discrepancy has been occasioned partly by the want of a catalogue, and partly also by the books being kept in close cases; but when we take into view the successive accumulations of so many centuries, and consider the number of entire libraries which have, at different times, been combined with this vast collection, we shall not probably err in estimating the total number of printed volumes at upwards of 500,000, amongst which is a choice collection of books printed in the fifteenth century.

But the superiority of this library consists not so much in the quantity of printed books it contains, as in the number of its manuscripts, which are said to exceed 50,000.[7] Some of these manuscripts are of the highest antiquity, such as

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Villiers, and printed in the Appendix to the Report on the British Museum (p. 511, et seq.), no notice whatever is taken of the library of the Escorial; whilst the regulations of a provincial library (that of the Junta of Commerce at Coruna) are inserted at full length.

[1] *Bibliotheca Arabico-Hispana Escurialensis*, Madrid, 1760–1770, in two vols. folio.

[2] See Appendix to the Report on the British Museum, pp. 514, 515, et seq.

[3] Eustace, *Classical Tour through Italy*, vol. ii. pp. 57, 58, London, 1817, in 8vo.

[4] Allatius wrote in Italian a tract on the conveyance of the Palatine Library to Rome, which tract was translated into Latin by Quade, and published at Gryphiswald, 1708, in 4to.

[5] *Rome in the Nineteenth Century*, vol. ii. p. 383, Edinburgh, 1822, in 8vo. Mr Eustace (*Classical Tour*, vol. ii. p. 56), makes the great hall only 800 feet in length, which seems more likely to be correct.

[6] Eustace, *Classical Tour*, vol. ii. p. 57.

[7] The number of manuscripts, like that of printed books, has been variously stated. In Starke's Guide (art. *Biblioteca Vaticana*, c. vii.) it is set down as "forty thousand." The authoress of *Rome in the Nineteenth Century* (vol. ii. p. 380) informs us that the col-

that of Virgil of the fifth century, written in capital letters, and illuminated with miniatures, representing the Latins and Trojans in the respective dresses of their own times; a Terence equally ancient; another of the ninth century, illuminated with ancient masks; a Greek Bible of the sixth century, written in capital letters, according to the Septuagint version, and from which all the subsequent copies have been taken; and the Gospels of St Luke and St John, written in the tenth century, and bound in ivory. Amongst the rare manuscripts in this splendid collection may also be mentioned, several Hebrew, Syriac, Arabic, and Armenian Bibles; a very large Hebrew Bible presented to the library by the Duke of Urbino, for which the Venetian Jews offered its weight in gold; a Greek manuscript containing the Acts of the Apostles, written in gold letters, and presented to Innocent VIII. by the queen of Cyprus; a Missal written in 1118; another adorned with miniatures by Giulio Clovio, the scholar of Giulio Romano, and the finest miniature-painter of his time; a large Breviary, ornamented with beautiful miniatures, and presented to the library by Matthias Corvinus, king of Hungary; the Annals of Baronius, in twelve volumes, written with his own hand; several volumes of Ecclesiastical History, by the learned Onofrio Panvinio; a Martyrology, curious on account of its antiquity and its miniatures; a manuscript of Pliny, with five miniatures of animals; a beautiful copy of Tasso's *Gierusalemme Liberata;* a Dante adorned with exquisite paintings, begun by the Florentine school, and finished by Giulio Clovio; a treatise on the Seven Sacraments by Henry VIII. of England; several Letters between that royal wife-killer and Anne Boleyn; several papers written by Martin Luther; and manuscripts on Egyptian papyrus. This library possesses a very fine cabinet of medals, which was carried off by the French, but compulsorily restored, after the events of 1814 and 1815. There is also attached to it a chamber filled with a fine collection of prints, to which admission can only be obtained by a particular order; and in another are deposited the secret archives of the Vatican, to which, of course, there is no admission at all. A cardinal is always nominal librarian; but the actual head of the Vatican Library is the celebrated Angelo Maio, so distinguished for the discoveries which he has made by deciphering the palimpsest or rescribed manuscripts.[1] In fine, there is every reason to conclude that the riches of this department have by no means been fully explored, and that an abundant harvest yet awaits future inquirers who to the requisite skill join inflexible perseverance.

Othe b. arie f Rom.

The other libraries at Rome, of sufficient importance to deserve notice, are the Barberini collection, containing about 50,000 printed books, and several thousands of manuscripts; the Colonna Library, distinguished for about four hundred volumes of books and engravings, printed or executed in the fifteenth century; and the collection of the Roman College, in which is contained the library and museum of Athanasius Kircher, the German Jesuit, so famous for his misapplied learning and ingenuity, not to add imaginative vagaries, on the subject of Egyptian hieroglyphics.[2]

Ambrosian library.

The Ambrosian Library, notwithstanding its appellation, has no connection with antiquity, and owes its existence entirely to the munificence of Cardinal Federigo Borromeo, nephew of Charles Borromeo, and his successor in the see of Milan. This prelate began to collect books, when a student at Rome; and enlarging his plan as he advanced in age and dignities, he, when raised to the archbishopric of Milan, erected an edifice, placed in it his collection, and opened it to the public under the title of *Bibliotheca Ambrosiana.* This library contains between 40,000 and 50,000 printed volumes, and upwards of 15,000 manuscripts; and there is annexed to it a gallery of pictures, statues, antiques, and medals, comprising many articles of great rarity and value. In the department of manuscripts is a collection of the various works of Leonardo da Vinci, enriched with his drawings and designs: it was presented by a citizen of the name of Galeas Arconati, who generously refused a vast sum for the precious treasure, and, to secure the possession of it to his country, consigned it to the Ambrosian Library as to an inviolable sanctuary. The sanctuary, however, was violated by the French—"di Parigi le vagabonde belve,"—in 1791, who seized the cherished relic of Leonardo's genius, and sent it off to Paris, tumbled and tossed in the common mass of plunder;[3] but what an abuse of victory enabled them to carry off, the fortune of war at length compelled them to restore. The same department also includes a Virgil with annotations by Petrarch, in his own handwriting; a Pliny, a Plato, and a Cicero of the second century; and a Josephus, on papyrus, written on both sides of each leaf. It is to be regretted, however, that the manuscript treasures of this collection have not been particularly described. Signor Angelo Maio, now librarian of the Vatican, formerly held the same office in the Ambrosian Library at Milan, and there commenced those researches relating to palimpsest or rescribed manuscripts, which have issued in the recovery of some ancient remains believed to have been for ever lost, and entitled this ingenious and indefatigable scholar to the lasting gratitude of the learned.[4] The other libraries of note in the Lombardo-Venetian territory are those belonging to the universities of Pavia and Padua. These libraries contain about 50,000 volumes each, and are open ten months in the year, four hours in winter and six in summer, every day excepting Wednesdays, Sundays, and holidays.[5]

Bologna library.

Bologna, celebrated for its scientific and literary institutions, and its academy for the encouragement and promotion of art, boasts likewise a great public library. This extensive collection, consisting of above 100,000 printed volumes, and from 4000 to 5000 manuscripts, is contained in the Manfredi Palace, and is open to the public six days in the week. In the same palace are, an observatory, furnished with an excellent astronomical apparatus; a large

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lection amounts to "*upwards* of thirty thousand." And Mr Eustace says that it is supposed to exceed "fifty thousand." The last estimate, we have reason to believe, is the nearest to the truth. As to the authoress of *Rome,* she evidently writes on a subject which she had not examined. Vasi, after describing the rarities of the Vatican, speaks of it as "arrichita collo spoglio di moltissime librerie di Europa, e di altrove ancora; tanto che in oggi non vi è una simile." (*Itinerario di Roma,* p. 503, Rome, 1777.)

[1] The palimpsest or rescribed manuscripts are those in which the ancient writing has been totally or partially obliterated, to make way for later compositions, merely to save parchment. From manuscripts thus barbarously manipulated, Signor Maio has recovered part of Cicero's celebrated treatise *De Republica;* the correspondence between Fronto and Marcus Aurelius, before and after the latter became emperor; a fragment of an oration by Q. Aurelius Symmachus, with the supplements of two other orations; and the supplement to the Ulpian Commentaries.

[2] Vasi, *Itineraire,* p. 552.

[3] Eustace, *Classical Tour,* vol. iv. p. 27, et seq.

[4] No account of this collection, that we are aware of, has appeared in recent times. Oppicelli's *Monumenta Biblioth. Ambros.* was printed at Milan in 1618, 8vo; and Boscha *de Orig. et Stat. Bibl. Ambros.* was published in the ninth vol. of Muratori's *Thesaurus,* part vi. An *Oratio de usu et fructu librorum Biblioth. Ambros.* appeared at Leyden in 1623, 8vo.

[5] *Bolletino Statistico ed Economico di Milano,* 1833.

chemical laboratory; a cabinet of natural history; an experimental cabinet, with all kinds of instruments for physical operation; two halls of architecture, civil and military; a gallery of antiquities, another of statues, and a third of paintings; with halls of anatomy and midwifery.[1] An establishment so complete in itself, and so concentrated for all the purposes of education and study, is nowhere else to be found. The other universities of the Roman states are also possessed of considerable collections of books. That of Perugia, founded as early as 1307, has a library of 30,000 volumes; that of Ferrara, founded at a much later period, has a library containing no less than 80,000 volumes; and the three universities of Macerata, Urbino, and Camerino, have each libraries, though upon a smaller scale.[2]

Florentine libraries.

The public libraries at Florence are the Mediceo-Laurenzana, or Laurentian; the collection bequeathed to the public by Magliabechi, by whose name it is distinguished; the Marucelliana; the Riccardiana, which was purchased not long since of the Riccardi family; and the library of the *Belle Arti*, containing the books which were taken out of the suppressed convents.

Mediceo-Laurentian library.

The Mediceo-Laurentian Library, which is contained in the convent annexed to the church of San Lorenzo, was commenced by Cosmo de' Medicis, the father of a line of princes whose name and age are almost synonymous with the restoration of learning. "His credit," says Gibbon, "was ennobled into fame; his riches were dedicated to the service of mankind: he corresponded at once with Cairo and London; and a cargo of Indian spices and Greek books were often imported by the same vessel."[3] As the natural disposition of this princely merchant led him to take a very active part in collecting the remains of classical antiquity, so his wealth and extensive commercial intercourse enabled him to gratify his taste to the fullest extent. He enjoined his friends and correspondents, as well as the missionaries who travelled into remote countries, to search for and procure ancient manuscripts in every language and upon every subject. He availed himself of the services of the most learned men, his contemporaries; and the situation of the eastern empire, then falling into ruins, afforded him an opportunity of obtaining many valuable works in the Hebrew, Greek, Chaldaic, Arabic, and Indian languages. After the death of Cosmo, his son pursued the same object with steady perseverance, and added considerably to the treasures which had been accumulated by his father. But although the ancestors of Lorenzo de' Medicis had laid the foundation of the Laurentian library, the honour of raising the superstructure belonged to Lorenzo himself, whose assiduity and liberality in enlarging his collection of books, manuscripts, and antiquities, were unbounded. To this object his time and his fortune, exceeding that of princes, were equally devoted. Shortly after the death of Lorenzo, however, this matchless collection was dispersed by the French troops under Charles VIII. in resentment of some imaginary insult; and in the perpetration of this sacrilegious deed, "the Gallic herd" were joined by the Florentines themselves, who openly carried off, or secretly purloined, whatever they could discover that was most rare, curious, and valuable. The library, however, was subsequently restored by the perseverance and liberality of Leo X. who caused it to be removed to Rome; but it was reconveyed to Florence by his successor Clement VII., who, by a bull dated the 15th of December 1532, made provision for its future security.[4] This library, the noblest monument which the Medicis have left of the glory of their line, contains about 100,000 printed volumes, and 9000 manuscripts, many of them of great rarity and value. The latter have been described in a catalogue of eleven folio volumes, undertaken and executed by the learned Bandini, formerly librarian, at the suggestion of the Emperor Francis I. who presented him with a sum of money towards the expense, and made him promises of further assistance, which, however, were rendered unavailing by the death of that sovereign.[5] The Laurentian Library is under the charge of Signor del Faria, who receives annually 396 scudi, or about L.94 sterling.

Magliabechian library.

Magliabechi, from being a servant to a dealer in vegetables, raised himself to the honourable office of librarian to the Grand Duke of Tuscany at Florence, and became one of the most eminent literary characters of his time. The force of natural talent overcame all the disadvantages of the humble condition in which he had been born, and placed him in a situation to make his name known and respected. But he endeavoured to deserve still better of his countrymen, by presenting them, some time before his death in 1714, with his large and valuable collection of books, together with what remained of his fortune, as a fund for its support. This constituted the foundation of the Magliabechian Library, which, by the subsequent donations of several benefactors, and the bounty of some of the grand dukes, was so much increased both in number and value, that it may now vie with some of the most considerable collections in Europe. The books printed in the fifteenth century have been described by the Abbate Follini, the present librarian, who dedicated his catalogue[6] to Ferdinand III.; but there is no general catalogue of the library. It is particularly rich in the early productions of the Italian press, which are described alphabetically, with much accuracy of detail; and to these are added brief notices of the lives of the different authors, derived from the most authentic sources. The Magliabechian Library is supposed to contain 150,000 printed volumes, and 9000 manuscripts; and the public are admitted to it every day of the year, except on Sundays and festivals. The Librarian has an annual stipend of 240 scudi, but not more than 100 scudi are expended annually in the purchase and binding of books.[7] The further extension of this collection is, therefore, effectually precluded, otherwise than by donations.

Other Florentine and Tuscan libraries.

The Marucellian, containing 50,000 volumes, is also under the charge of Signor del Faria of the Laurentian, and it is open every Monday, Wednesday, and Friday. The Riccardi collection is managed by the Canon Bianchi and a sub-librarian; it contains 26,000 volumes. The collection of the *Belle Arti* consists of 11,000 volumes, and is open to the public every Tuesday, Thursday, and Saturday. The disbursements on account of these various libraries are made by their respective librarians, under the control of the minister of the interior; the sums expended, however, are but trifling. The libraries of the universities of Pisa and Sienna are valuable, each of them possessing about 50,000 volumes, to which an annual addition of books to the value of 100 scudi is respectively made. In almost all the provincial towns of Tuscany, there are also to be found public libraries more or less extensive, which are all placed under the control of the communal magistrates.[1]

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[1] Eustace, *Classical Tour*, vol. i. p. 164.

[2] Serristori, *Saggio Statistico dell' Italia*, 1833.

[3] *Decline and Fall of the Roman Empire*, vol. xii. p. 136.

[4] Roscoe, *Life of Lorenzo de' Medicis*, vol. i. pp. 37, 38, and vol. ii. pp. 60, 254, 284, et seq.

[5] Roscoe, *Life of Leo X.* vol. iv. p. 181, note, 8vo ed. See also *Bibliotheca Leopoldino-Laurentiana; sive Catalogus Manuscriptorum qui jussu Petri Leopoldi in Laurentianam translati sunt*, &c. Florence, 1791, 1792, 1793, &c.

[6] *Catalogus Codicum sæculo xv. impressorum, qui in publica Bibliotheca Magliabechiana Florentiæ adservantur.* Florence, 1793–1795, in three vols. folio.

[7] Appendix to the Report on the British Museum, pp. 488, 489.

Neapolitan libraries. There are five public libraries at Naples, viz. the Royal Library, the Brancacciano Library, the library of the University, the library of the Military Staff, and the library of the Monks of St Jerome. The Royal Library contains about 300,000 printed volumes and 6000 manuscripts; the University possesses 50,000 volumes; the Convent of St Jerome has an equal number; the Brancacciano contains 10,000; and the Military Staff has 10,000. The public have free admission to read in these libraries, but no books are allowed to be taken away. They are all open every day, for about six hours, excepting on holidays, when they are closed. The expenses of the Royal Library are included in those of the Museum, of which it forms part. It is entitled to two copies of all books printed in the kingdom of Naples; and 4000 ducats (L.687) are annually appropriated to the purchase of foreign books. The expenses of the library of St Jerome are defrayed out of the funds of the Convent to which it belongs; but, like the Brancacciano, the Military Staff, and the University Libraries, it is entitled to one copy of every book printed in the kingdom of Naples. This collection is singularly rich, chiefly in ancient books. There are no public libraries in any of the provincial towns, excepting Foggia and Lucera; but in every diocese there is a library belonging to the see, to which, upon application, admission may at all times be readily obtained.[2]

Libraries of Venice, Turin, &c. The remaining libraries in Italy are numerous, and some of them considerable, particularly those of Venice and Turin. In the library of St Mark at Venice, there is a copy of the Gospel of the evangelist of that name, which is affirmed to have been written by himself. This library was founded in the fourteenth century, the collection having been begun by Petrarch, who bequeathed his books to the republic. Cardinal Bessarion, by his will, added to the library the curious collection of manuscripts which he had formed in Constantinople, in Egypt, and in Greece; and further additions were subsequently made to it by other cardinals. The library of St Mark is deposited in two apartments, one of which is appropriated to manuscripts, whilst the other contains the printed books. Though small when compared with other libraries of the Continent, this collection includes many rare and valuable articles.[3] The library attached to the university of Turin contains 112,000 printed books, and a rich collection of manuscripts. It is open to the public in general every day except festivals. Connected with the university are several museums, particularly that of Egyptian antiquities, purchased by the king, of Mr Drovetti, which is one of the richest and most valuable in Europe. Attached to the university of Genoa, which now belongs to the king of Sardinia, is a library, consisting of about 45,000 volumes.[4] Several public and private libraries at Padua contain a number of manuscripts; as do also the chapters of Verona, Novara, and Vercelli. From a rescribed manuscript discovered by Niebuhr, the Roman historian, in the collection of the chapter of Verona, was deciphered and published no inconsiderable portion of the Institutions of Gaius, which served as a model to Justinian, or rather to Tribonian, in framing that elementary exposition of principles which is prefixed to the Digest. The library at Mantua is inconsiderable. The library of Messina in Sicily contains a valuable collection of Greek manuscripts, described in a catalogue, printed in the ninth volume of Grævius's *Thesaurus Antiquitatum et Historiæ Siciliæ*.[5]

Libraries of Germany. The libraries of Germany, taking that name in its widest acceptation, are, some of them, of the first order, and many of them extensive and important; but, from the length to which this article has already extended, we must confine our notices exclusively to the principal collections, which we shall describe in the order, not of place or of time, but of their relative magnitude and value.

Imperial library at Vienna. The Imperial Library at Vienna is perhaps inferior only to that of the Vatican and the Royal Library at Paris, for the rarity and value of its contents. It was founded by the Emperor Frederick III. who spared no expense to enrich it with printed books as well as manuscripts in every language. By the munificence of succeeding emperors, numerous important and valuable accessions were made to the collection; amongst which may be mentioned the large and interesting library of Prince Eugene, and a considerable portion of the Buda Library, founded by Matthias Corvinus, king of Hungary. The Imperial Library occupies eight spacious apartments; and a ninth is appropriated to a very valuable collection of medals and other curiosities.[6] It contains 350,000 volumes of printed books, and 16,000 volumes of manuscripts.[7] The books are disposed according to their sizes, and comprise almost a complete series, exhibiting the origin and progress of the typographic art. The number of works printed in the fifteenth century exceeds 12,000, amongst which are four out of the five *incunabula* on vellum, printed by Pannartz at Rome. Here also is a copy of the Soncino Bible, printed in 1488, by far the scarcest, and perhaps the most valuable of all the impressions; a copy of the first edition of Apuleius, printed in 1469, on vellum, and unique; and a copy of the first edition of Aulus Gellius, printed the same year, on vellum, and also unique. These two treasures were once the property of Cardinal Bessarion, and are comparatively but recent acquisitions of the imperial collection. The Florence Dante of 1481, with the commentary of Landino, and the plates of Baldini from designs by Boticelli, is likewise in this library. This is the finest copy extant, excepting that in Earl Spencer's collection, each of which possesses twenty copperplates.[8] The Cimelia, or remarkable rarities, are twenty-four in number. Amongst these are, a tablet of bronze, containing the original *senatus-consultum* or decree of the Roman senate for the suppression of the Bacchanalians, passed in the year 186 before Christ;[9] *Tabula Peutingeriana*, a travelling map of the Roman empire in the fourth century, on parchment; several palimpsests procured from the monastery of Bobbio; and the great roll of Mexican picture writings, published by Lord Kingsborough. A few of the manuscripts deserve to be mentioned, on account of their singular rarity. Amongst these are, a Mexican manuscript, with coloured figures, on human skin; a manuscript of Livy, of the fifth century, of which a few pages are wanting; a manuscript of St Mark's and St Luke's Gospels, written in gold and silver characters; and a manuscript of Dioscorides, with coloured drawings of plants, written in the fifth century, by order of the Princess Julia Anicia, only daughter of the Emperor Olybrius. This precious manuscript was brought from Constantinople in 1550, by the celebrated Busbequius,[1] ambassador from Charles V. to the Porte, by whom about 300 other Greek manuscripts were collected in the Turkish capital, including a manuscript of Pliny's *Historia Naturalis*, of contemporary date. Besides these there are, in this collection, fragments of Genesis in uncial Greek, the letters silver embossed on purple parchment, richly ornamented with miniature paintings; a fragment on papyrus, containing the decrees of the third council of Constantinople, held in the year 680; *codex clathratus*, or fragments of the most ancient German translation of the Gospel of St Matthew, written in the early part of the eighth century;[2] a German Bible in six volumes folio, richly illuminated, written for the Emperor Wenceslas, in the fourteenth century; a French manuscript of the fourteenth century, written in large letters, according to the ancient orthography, profusely illuminated, and containing the history of Tristan, the celebrated knight of the Round Table; together with many other rare, curious, and interesting manuscripts. The Greek manuscripts in the Imperial Library have been described by Lambecius, Nessel, and Kollarius, whose labours were confined to this class; and in the important and accurate work of Denis may be found an ample account of the Latin, with a few notices of oriental manuscripts, the ages of the different manuscripts being stated where these could be ascertained. Besides the cabinet of medals, there is also attached to the library a superb collection of engravings, consisting of 473 large folio volumes, 510 volumes of different sizes, and 215 folio cartoons. The collection of music contains 6000 volumes, theoretical and practical; and that of autographs exceeds 8000 pieces, classed under the heads of monarchs and princes, ministers and statesmen, poets, philosophers, and men of learning or science, generals and renowned warriors, artists, and others. The sum allowed for the purchase of new books is about L.2000 annually. The Imperial Library is open to the public every day except on Sundays, holidays, and the vacations.[3]

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[1] Appendix to the Report on the British Museum, *ubi supra*.

[2] App. to Report, pp. 490, 491.

[3] Balbi, in the appendix to his *Essai Statistique*, gives some very extraordinary particulars of the *Archivio Generale* at Venice, to which great attention is paid by the Austrian government. This unparalleled collection contains 8,664,709 stitched quires, divided into 1890 departments, and arranged in 298 apartments. But whether its value corresponds with its magnitude, is a point on which we have been left to our own conjectures. See *Athenæum* for the 19th March 1836.

[4] The General Sardinian Calendar for 1831.

[5] Horne, *Introd. to the Study of Bibliography*, pp. 600–605.

[6] "Ce cabinet est encore plus remarquable par la collection de toutes les monnoies, qui est unique dans le monde, quoiqu'elle ne soit pas absolument complète." (*Voyage de deux Français*, tom. iv. p. 144, Paris, 1796.) It is not equal to the *Monetario* at Madrid.

[7] Stein, *Geographie und Statistik*, vol. ii. p. 363. Balbi, *Statisques sur les Bibliothèques de Vienne*, 1835.

[8] Dibdin's *Bibliographical Tour*, vol. iii. pp. 291, 486, 518. See also his *Library Companion*, pp. 22, 581, 752.

[9] This is the same decree which is cited by Livy (lib. xxxix. c. 18); it was found in Calabria, on the estate of Prince Cigala. (*Voyage de deux Français*, tom. v. p. 136.)

University, and other libraries at Vienna.

In Vienna, the University Library ranks next to the Imperial Library, but the number of books in it is not stated by Balbi. It received the collections which belonged to the convents suppressed by Joseph II.; and since 1806 it has had a right to a copy of every work printed in Lower Austria. Amongst what are called the private libraries, the most important is that of Military Archives, established in 1801, upon a plan devised by the Archduke Charles. It contains 6626 works on military science and art; twenty large folio volumes of bulletins, gazettes, and journals, with an index; seventy-three atlasses, with about 3000 charts, maps, and plans, of various kinds; and a small collection of manuscript military memoirs, amongst which are those of Montecuculi, who commanded the imperialists opposed to Turenne, and of Prince Eugene. The libraries of oriental literature, of natural history, of the Philharmonic Society, and of the Imperial Archives, are also of great value. In the last are preserved the archives of Venice, and Marino Sanudo's original history of that republic, in fifty-six volumes, which was unknown when M. Daru published his celebrated work. Of the libraries belonging to individuals, the most remarkable are those of Prince Metternich, M. Von Hammer, and Mr Castelli. Von Hammer possesses an unrivalled collection of Turkish manuscripts. Mr Castelli's is a dramatic collection, containing upwards of 10,000 German dramas, original and translated; about 500 manuscripts; 700 portraits of actors, actresses, and dramatists; and an unique collection of play-bills from the year 1600. The total number of libraries, public and private, in Vienna, is forty-five; and even the latter are accessible to students furnished with proper introductions.[4]

Royal library at Munich, &c.

The Royal Library at Munich is the most extensive collection in Germany, containing 500,000 volumes of printed books and 16,000 volumes of manuscripts; thus exceeding the Imperial Library at Vienna by 150,000 printed volumes, and equalling it in the number of manuscripts. From a discourse on the origin and increase of the library at Munich, delivered in 1784, by the Canon Steigenberger, the librarian, and translated into Latin by Vitali, it appears that the Hebrew, Arabic, Syriac, Greek, and Latin manuscripts contained in this library then formed a precious treasure; and, since the period to which this discourse refers, numerous and important additions have been made to all the departments of the collection. The ancient manuscripts relative to the art of music amount to a great number, and are exceedingly curious.[5] A catalogue of the Greek manuscripts in this library, compiled by Ignatius Hardt, was printed at Munich in 1806.[6] The Royal Library is deposited, not in the palace, but in a college formerly belonging to the Jesuits, where it occupies a handsome building. It is open to the public at certain hours each day, Sundays and holidays excepted.[7] Besides the Royal Library, Munich has its University Library, which contains 160,000 printed books.[8]

Royal library at Dresden, &c.

The king of Saxony's library at Dresden contains 300,000 volumes of printed books, besides 150,000 dissertations, and 2300 volumes of manuscripts. The valuable library that formerly belonged to Count Bunau forms part of this noble collection, which is most complete in general history, and in Greek and Latin classic authors. Amongst the printed books are some of the rarest specimens of early typography, including 600 of the Aldine editions, and many on vellum, besides a copy of the first edition of the *Orlando Furioso*, printed by Mazocco, "coll' assistenza dell' autore," in 1516, and other rarities. In the department of manuscripts are, a Mexican manuscript, written on human skin, containing, according to Thévenot, a calendar, with some fragments of the history of the Incas; *Liber de re militari*, on vellum, with superb paintings in fine preservation, presented to an elector of Saxony, by Matthias Corvinus, king of Hungary; the original manuscript of the *Reveries* of Marshal Saxe, bearing at the end that he had composed this work in thirteen nights during a fever, and completed it in December 1733; a fine copy of the Koran, taken from a Turk by a Saxon officer, at the last siege of Vienna, and said to have formerly belonged to Bajazet II.;

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[1] Of this manuscript Dioscorides Busbequius himself has given a very interesting account. See Busbequii *Epistolæ*, lib. iv. p. 391.

[2] These fragments were found in some old bindings of books.

[3] Balbi, *Statistiques sur les Bibliothèques de Vienne;* Horne, *Introd. to Bibliog.*

[4] See an abstract of Balbi's *Essai Statistique* in the *Athenæum* of the 19th March 1836.

[5] Burney's *Present State of Music in Germany*, vol. i. p. 129.

[6] It is entitled *Catalogus Codicum Manuscriptorum Bibliothecæ Regiæ Bavaricæ*, 4to.

[7] *Voyage de deux Français*, vol. i. p. 17.

[8] A more particular account of this library may be found in Schaden's *Beschreibung der Haupstadt München*, p. 78, 1833, 2d ed.

a Greek manuscript of the Epistles of St Paul, of the eleventh century; and a very fine collection of portraits of the most celebrated persons of the seventeenth century, by Rabel, a French artist, the outlines only having been engraved.[1] An extensive collection of antiquities is preserved, in twelve apartments under the library, below which are eighteen vaulted cellars, stored with a vast quantity of valuable porcelain, partly of foreign, and partly of Dresden manufacture. The expenses of the Royal Library are defrayed by the state. The sum of 2500 dollars, equal to L.375, is allowed yearly for the purchase of books, binding, &c. The only other public library in Saxony is that at Leipzig, which is principally intended for the use of the university of that city; it is under the control of the minister of public worship, and contains 110,000 printed volumes, and 2000 volumes of manuscripts. There are printed catalogues of all the collections at Dresden, excepting those of natural history and of engravings. These libraries are open to the public, except on Sundays and holidays.[2]

Library of Göttingen.

The library attached to the university of Göttingen contains 300,000 printed volumes, and 5000 volumes of manuscripts. But its extent is its least recommendation; for it is not only the most complete amongst the universities, but there are very few royal or public collections in Germany which can rival it in real utility; and if not in Germany, where else? It is not rich in manuscripts, even including the acquisitions which it made from Helmstadt, when the university of that place was dissolved; and many other libraries, as Mr Russell justly observes, surpass it in typographical rarities, and specimens of typographical luxury; but none contains so great a number of really useful books, in almost every branch of human knowledge. This library is mainly indebted for the pre-eminence it has obtained to the labours and exertions of the illustrious Heyne. In the year in which he came to Göttingen as second librarian, the entire control of the library was committed to him, and he became chief. From this moment commenced at once its extension and its improvement. When Heyne went to Göttingen, it already possessed a library of from 50,000 to 60,000 volumes, which, compared with those of most universities, was a considerable collection. At his decease it had, according to the most moderate computation, increased, exclusively of extraordinary acquisitions, to upwards of 200,000 volumes. But this increase of number was its smallest claim to admiration. At the commencement of this period entire departments of learning were wholly wanting; at its close not only were these deficiencies supplied, but the library had become proportionally rich in every department, and, in point of completeness, unrivalled. It would be interesting to trace the manner in which this change was effected; but neither our plan nor our space admits of such details. The system of catalogues appears to be somewhat complete. There are, in fact, four catalogues connected with each other. Every addition to the library is first entered in the *Manual* of the year, in which are concisely written the title and date of the book, and the day of its reception. Then the book is entered with its full title in the *Accession-Catalogue*, which is also commenced with every year, and forms at its close four volumes; the first containing entries of books on theology; the second, of books on jurisprudence; the third, of those on history; and the fourth, miscellaneous works. These two catalogues are intended more particularly for the use of the librarians; the remaining two are for readers. The third of the series is a complete *Alphabetical Catalogue*, in which every book is entered under the author's name, when given, or, when not given, but known, with a reference thereto under the chief word of the title. Every book of which the author's name is not known, is entered under such chief word of title; and, on one side, are also entered the date and form, with reference to the entries of the same book in the Manual and the Accession-Catalogue; on the other is entered the head of the classed catalogue to which the book belongs. Lastly, the book is entered in the *Classed* or *Scientific Catalogue*, according to its subject, and is then placed in that division of the library to which it belongs. The alphabetical catalogue answers the question, whether a certain book is in the library, and where it is to be found; and the scientific or classed catalogue shows what books are contained in the library upon any given subject. Such is a brief account of the mechanism of this very extensive library. A full exposition of it would require the scientific *schematismus* upon which the whole is founded, and would lead us to take a general survey of human knowledge.[3]

Royal library at Berlin.

The Royal Library at Berlin contains 250,000 volumes of printed books, and 5000 volumes of manuscripts. This collection includes works upon almost all the sciences, and in nearly all languages, but it is perhaps most complete in the sciences. Amongst the manuscripts are several Egyptian deeds, written on papyrus, in the demotic or enchorial character, but whether with or without Greek registries, we have not ascertained. Professor Kosegarten, in his first commentation on the Ancient Literature of the Egyptians,[4] has published fac-similes of a considerable portion of one of these, and of the *exordia* of twelve others, with interlinear translations in Latin, according to Dr Young's method of interpretation. The same department also includes several manuscripts of Lacroze, the celebrated author of the Coptic Lexicon, particularly his reply to Bergier, in which he mentions the additions made to the Royal Library, the librarians, the number of books at the time when he wrote, and the curious articles contained in the collection. No complete catalogue has ever, so far as we know, been printed. Heinrick's *Notitia*, printed in 1687, 4to, and his *Pandectæ Brandenburgicæ*, printed in 1699, folio, are both incomplete, the latter including only the first two letters of the alphabet; but, even if they had been finished works, they could have afforded little or no help in ascertaining the actual contents of the collection. A good analytical account of this library is still a desideratum.

Library of Stuttgart.

The public library at Stuttgart contains 197,000 printed volumes, and 1800 volumes of manuscripts. It is divided into three departments, each of which is under the superintendence of one of the librarians, who are charged with the purchase and binding of books, the keeping of catalogues, and other duties. The general government of the library is vested in directors, who endeavour, as far as their means allow, to procure every thing that is of real worth or value. Recommendations from any of the authorities of the state, for the purchase of particular works, are invariably attended to. All booksellers in the kingdom are required to furnish a copy of every work published by them. To certain persons, and under certain regulations, books are allowed to be lent out from the library. The annual expense of the establishment amounts to about 7000 florins, of which about 4000 are expended in the purchase of books; and it is defrayed out of the public treasury. There is a provincial library at Tubingen.[1]

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[1] *Voyage au Nord de l'Europe*, vol. i. p. 71, et seq.

[2] Appendix to Report, p. 495.

[3] Heeren, *C. G. Heyne's Biographisch dargestellt*, Göttingen, 1812, in 8vo. "Was hülfe eine Bibliothek von mehr als 200,000 bänder," says Heeren, "wenn man nicht wuszte was man hätte, wenn man nicht wuszte wo das was man hat, zu finden sey?" (*Ubi supra.*)

[4] *De Prisca Ægyptiorum Litteratura, Commentatio prima*, tab. ix. et seq.

Other German libraries.

The library of Wolfenbuttel is little inferior to that of Stuttgart; it contains 190,000 printed volumes, with a few manuscripts. Besides the libraries connected with various public institutions, as the Seckenburg Museum, and the institution of Staendel for the Fine Arts, there is a public library at Frankfort, called the *Stadt Bibliothek.* This collection contains 50,000 volumes of printed books, and 500 volumes of manuscripts, of which 20 are Abyssinian, 12 Turkish and Persian, 6 Hebrew, 2 Indian and Burmese, and the rest in Latin, German, and other languages. No catalogue of this library has been published since 1728; but a new descriptive one is, it seems, in progress. The annual expense, which amounts to about 4400 florins, is principally contributed by the public treasury.[2] The library of Naumburg was founded in the sixteenth century by Julius Pflug, bishop of that place, who is celebrated in ecclesiastical history as a zealous opponent of the Reformation, and as one of the three divines deputed by Charles V. to draw up the plan of the Interim in 1548. In the seventeenth century this library received a further augmentation by the purchase of the collection of books formed by Thomas Reinesius. The printed books and manuscripts, though few in number, are of considerable value. Amongst the latter are the Scholia of Olympiodorus on several of Plato's Dialogues, written in the sixteenth century; a fragment of Orpheus's Argonautics, of the fifteenth; the Olympic Odes of Pindar, of the sixteenth, apparently transcribed from an ancient manuscript; the Cassandra of Lycophron, with the Commentary of Tzetzes, dated 1438; and several tracts of Jamblichus, on the Pythagorean philosophy, belonging to the fifteenth century.[3] From these manuscripts Müller, in his excellent catalogue, printed at Leipzig (1806–1811, in 8vo) has given a selection of various readings.[4]

Dutch libraries.

There are many libraries in Holland, indeed almost every city has one, but the principal collection is that belonging to the university library of Leyden. This library was founded by William I. prince of Orange, and is justly celebrated throughout Europe for the many valuable specimens of Greek and oriental literature with which it abounds. To it Joseph Scaliger bequeathed his fine collection of Hebrew books; and it was further enriched by the learned Golius, on his return from the East, with many Arabic, Turkish, Persian, and Chaldaic manuscripts. In addition to these, it received the collections of Holmanus, and particularly those of Isaac Vossius and Ruhnken; the former containing a great number of valuable manuscripts, supposed to have once belonged to Christina queen of Sweden; and the latter, an almost entire series of classical authors, with a collection of manuscripts, perhaps unique, amongst which are to be found copies of several that were consumed by fire in the Abbey of St Germain-des-Prez. The library at Leyden is computed to contain 60,000 printed volumes, and 14,000 volumes of manuscripts, many of which, as we have seen, are equally curious and valuable.[5] Of the public library at Amsterdam, Peignot drily remarks that it would be more useful if the books it contains were arranged in better order and method.[6]

Belgian libraries.

At Brussels there are two principal libraries; one of which, composed of printed books, belongs to the city, and the other, consisting entirely of manuscripts, belongs to the government. The former was founded on that which formerly appertained to the house of Burgundy, a family that gave to Flanders several counts or earls, by whose liberality it was enriched with numerous valuable manuscripts which, it would appear, are now separated from the collection. Santander[7] traces the history of this library through its various fortunes, having been successively burned, buried under ground, and decimated by French commissaries on the capture of Brussels. Though restored to its ancient splendour by the care of Count de Cobentzel and of Prince Stahremberg, minister plenipotentiary of the empress-queen, its prosperity was of short duration. For, when the French armies overran the Netherlands, and occupied Brussels, in 1797, Laurent, the representative of the people, caused seven waggon-loads of books and manuscripts to be taken from the Burgundy Library; and some time afterwards, Wailly, Leblond, and others, deputed to commit a second spoliation, selected about 200 manuscripts for the National (Royal) Library at Paris. In 1797, a place was provided for the reception of the books belonging to the Burgundy Library; and in 1798, the collection was enriched with all that was most valuable from the great depôt of the Cordeliers, which was then broken up. Since that period the Brussels Library has, by gradual acquisitions, become more extensive than ever, and at present contains 140,000 volumes of printed books. The library of the government, as it is called, comprises 15,000 volumes of manuscripts, which, however, have not been particularly described. The city library is open four days in the week, from ten o'clock in the morning until two in the afternoon, and the public have free access to the collection. The ordinary annual expense of this establishment amounts to 4800 francs (a mere trifle), but additional sums are from time to time granted for the purchase of books. The library of the government is open every day from nine in the morning until four in the afternoon; and the annual expense amounts to 10,000 francs. The first of these establishments is supported by the city, the second by the government out of the public treasury. The provincial libraries of Belgium are those of Antwerp, Bruges, Ghent, Liège, Louvain, Mons, Namur, and Tournay, three of which (those of Ghent, Liège, and Louvain) are under the direction of the universities established at these places, whilst the others are under the superintendence of the local authorities.[8]

Libraries of Hungary.

It is well known that a noble library, rich in valuable manuscripts, had been formed at Buda, by the celebrated Matthias Corvinus, king of Hungary; but this collection was dispersed, on the capture of Buda by the Turks under Solyman in 1526; and Cardinal Bozman in vain offered the conqueror two thousand crowns to restore this part of the spoil. Some of the books which belonged to it have been found in the Imperial Library at Vienna, in that of Wolfenbuttel, and in the private collection of Morelli, librarian of St Mark's at Venice.[9] By the liberality of Count Sczecheny, his private collection at Pesth has become the library of the kingdom of Hungary. The books are entered alphabetically in the catalogue and supplements, and classed in the indexes according to the subjects. M. de Miller, librarian to the count, having discovered several works printed at Gros-waradin in the sixteenth and seventeenth centuries, published an account of them at Pesth in 1804.[1]

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[1] Appendix to Report, p. 486.

[2] Appendix to Report, pp. 492, 493.

[3] Horne, *Introduction to Bibliography*, vol. ii. p. 582.

[4] There is a library at Berne, in Switzerland, containing 35,000 printed volumes, and upwards of 1000 manuscripts, philological, classical, and historical; but it is not of sufficient importance to deserve a separate notice.

[5] Horne, *Introduction to Bibliography*, vol. ii. pp. 593, 594. See also the art. LEYDEN.

[6] Peignot, *Dict. de Biblioth.* tom. i. p. 99.

[7] *Mémoire historique sur la Bibliothèque publique de Bruxelles*, Bruxelles, 1809, in 8vo.

[8] Appendix to Report, p. 486.

[9] Morhof, *Polyhist.* lib. i. c. 4, § 21. Delandine, *Bibliothèque de Lyon*, tom. ii. pp. 67, 68. Morelli, *Bibliotheca Græca*, tom. i. pp. 330, 405, 417.

Li ries of land.

Of Poland it may be said, in a bibliographical as well as political sense, *Stat magni nominis umbra.* The literary treasures of that ancient kingdom have gone to enrich its principal spoiler; and it is at Petersburg rather than at Warsaw that we must seek for evidence of what it originally possessed. What is called the King's Library at Warsaw does not much exceed 20,000 volumes, most of which are modern; but it contains a manuscript, in three folio volumes, with nearly two hundred fine drawings, descriptive of the antiquities excavated at Velleia between the years 1760 and 1765. The university of Warsaw, founded by the Emperor Alexander in 1816, had accumulated a library of about 150,000 volumes; but, since the events of 1830 and 1831, every book and pamphlet in it, conceived to be hostile to the Russian government, have been removed, and numbers of scientific works have likewise been abstracted and sent off to St Petersburg. The university of Cracow has also attached to it a library, containing about 4000 manuscripts, amongst which is a Latin encyclopædia, in a large folio volume, written by Paul of Prague in 1459. But the most extensive and valuable collection in Poland was that which Count Zaluski and his brother had formed, and which, in 1747, was devoted to the public. The Zaluski Library, called also the Library of the Republic, originally consisted of 300,000 volumes, including upwards of 50,000 duplicates, which were subsequently disposed of; and by the sale of these, together with the losses sustained by various depredations, the collection was supposed, in 1791, not greatly to exceed 200,000 volumes. At length, in 1795, this library was unceremoniously seized by Suwarof, hastily packed up, and despatched to St Petersburg, to aggrandise the conqueror with the literary spoils of Poland.

Th mpe- rial brary at S Pe- ters rg.

The Imperial Library of St Petersburg is, according to Mr Edwards, "the *creation* of but a few years."[2] We confess our inability to understand what this gentleman means by the word "creation" here employed by him. A robber does not surely create the wealth which he forcibly appropriates. Considerably more than half the actual contents of the Imperial Library were obtained by one act of wholesale spoliation. The French, when they conquered Italy and Belgium, decimated the libraries of those countries. But the Russians, when they triumphed over the independence of Poland, carried off entirely the largest collection of books which that country could boast of. The original founder of this library was Joseph, count de Zaluski, bishop of Kiof. In the space of forty-three years he had acquired, at his own expense, above 200,000 volumes. His brother, Andrew Zaluski, bishop of Cracow, enriched this numerous collection, as well with books drawn from the museum of John III. king of Poland, as with those which he collected from the libraries of his uncles, Andrew Olszofski, primate of the kingdom of Poland, Prince Andrew Chrysostom, bishop of Warmia, and Louis Bartholomew, bishop of Plock; and after having joined to these the collection in his own cabinet, he transferred the whole, in 1742, to a house which had previously belonged to the family of Danilovitch, and had probably come to him by inheritance. In 1747 he rendered it public, and fixed an annual income or endowment for its support and increase. After the death of this prelate, his brother, Joseph Zaluski, still further augmented it by the addition of a great number of volumes, and, by his will, made in 1761, bequeathed it, along with the house in which it was deposited, to the college of Jesuits at Warsaw.[3] After the suppression of that order in 1773, it was placed under the care of the commission of education, and at last transferred to St Petersburg in 1795, as already mentioned. This transportation being made by land, and along roads which the late season of the year rendered impracticable, several cases suffered much from the inclemency of the weather, others were broken or damaged, and the books which they contained spoiled, misplaced, or separated, and the sets broken. The collection was conveyed to the imperial cabinet in two convoys, and after the inventory had been completed on the 23d of February 1796, it was found that the collection still amounted to 262,640 volumes, and 24,573 prints. This library, thus seized and carried off, and which had been packed in such haste at Warsaw, that the books had been huddled in without any order, so that the volumes of the same work were found dispersed in different cases, comprised in general all that relates to the sciences, the arts, and the belles-lettres. The theological, and, after it, the historical and literary branches, were the most considerable. The theological department alone comprehended above 80,000 volumes. It was also rich in topography, especially the histories of towns; and the literary branch included a precious collection of classical books and works on bibliography; but the departments of philosophy, mathematics, physics, voyages, and antiquities were very incomplete.[4] Such was the "creation" which formed the basis of the Imperial Library at St Petersburg, and but for which that collection, instead of now ranking in the first class, would scarcely have been entitled to a place in the third.

This library, augmented by various other collections, amounts to about 400,000 printed volumes, and 16,000 volumes of manuscripts. Its management is detailed at length in the Appendix to the Report of the Select Committee on the British Museum (p. 449, et seq.), to which we refer. The total annual expense for the support of the Imperial Library, and paying the salaries of the employés, amounts to 45,000 roubles; and the paltry sum of 7000 roubles is the utmost that is allowed in any year for the purchase of books; from which we may infer that its principal chance of further increase depends, not on the liberality of the Russian government, but on the probability of some new conquest, followed closely by a fresh act of spoliation. The public is admitted to the library every Tuesday from eleven o'clock in the forenoon to three in the afternoon, to visit the establishment, and on the Wednesdays, Thursdays, and Fridays of each week, to read or make extracts therein.

A most laudable attempt is making to introduce a new bibliographical system of classification, which we shall en-

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[1] *Fragmenta veteris Typographiæ Magno-varadensis*, Pesth, 1801, in 8vo.

[2] Letter to Benjamin Hawes, Esq. M. P. p. 35, note.

[3] "The celebrated library of Zaluski at Warsaw," says Denis, in his *Introduction to the Knowledge of Books*, "was opened to the public in 1747. It must contain at present near 300,000 volumes. Benedict XIV. in 1752, issued a bull of excommunication against those who should dare to commit depredations on this library; but, notwithstanding, many books were carried off, particularly during the late troubles. In 1747, the laborious librarian, Ianozki, made notices of the rare books printed in Polish; and, in 1752, he published a catalogue of the manuscripts in this library. After the death of its founder, the Bishop of Kiev, the king and the commonwealth took possession of this treasure, in spite of the attempts made by the heirs to retain it." (Denis, *Einleitung in die Bücherkunde*, Wien, 1777, th. i. p. 184.)

[4] See *Précis Historique sur la Fondation, l'Acquisition, et l'Arrangement de la Bibliothèque Imperial*, Appendix to Report, p. 457, et seq.

Modern Libraries.

deavour to describe as briefly as possible, by exhibiting the plan of the catalogues as stated in the official returns.[1] These are, 1st, *Le catalogue alphabétique des livres, par ordre des matières*; 2d, *Le catalogue alphabétique des auteurs*; and, 3d, *Le catalogue raisonné, où les matières seront classées d'après le nouvel ordre bibliographique, avec des observations sur les livres et sur les éditions rares.* Their redaction must be exemplified rather than described. The books already entered in the catalogues of the different sections of the library have their titles re-transcribed on separate *feuillets*, or slips of paper, after the following model:

Danicorum Monumentorum Libri Sex:
e spissis antiquitatum tenebris et in Dania ac Norvegia extantibus ruderibus eruti ab *Oloa Worm.* D. Medicinæ in Acad. Haffn. professore publ.
Haffniæ, apud Joachimum Moltkenium, Bibliopolam ibidem primar. A° MDCXLIII.

The *feuillets*, or slips, thus prepared, are daily distributed amongst the employés, each intrusted with a particular division, and taking the titles belonging thereto, which are arranged in portfolios, for the purpose of facilitating their assortment. If a book treat of several subjects, it is first entered under that to which it most immediately belongs, and afterwards under the others. Each employé then inscribes on these *feuillets*, severally, the initial letter of the title, the author's name, the class, division, section, and position in the library, of the book, its size and number, as in the following model:

D		O. Worm.
Historia. Paralipomena Historica Archæologia.	Danicorum Monumentorum libri sex: e spissis antiquitatum tenebris et in Dania ac Norvegia extantibus ruderibus eruti ab *Oloa Worm.* D. Medicinæ in acad. Haffn. Professore publ. Hafniæ, Apud Joachimum Moltkenium, Bibliopolam ibidem primar. Anno MDCXLIII (1643).	VII. B. 1 vol. in fol. N. 3673.

The slip, thus prepared, is transferred to the employés engaged on the several catalogues; 1st, to the alphabetical catalogue, in the order of subjects; 2d, to the alphabetical catalogue, in the order of authors' names; and, 3d, to the *catalogue raisonné*, or classed catalogue; so that all of these proceed simultaneously without the least difficulty or confusion. With regard to the first, in the alphabetical order of subjects, it is held sufficient to inscribe in the catalogue the titles of books in an abridged form, which it is unnecessary to exemplify. It appears by the official returns, that the number of books put in order is about 103,000, and that the number already entered in the catalogues amounts to about 90,000.[2]

Academy of Sciences.

The Academy of Sciences at St Petersburg was instituted by Peter the Great, who, in his travels, had observed the benefits resulting from public societies for promoting the advancement of knowledge. The library of the Academy originated in 2500 volumes which the Czar had, *more Rossico*, seized at Mittau in his Swedish campaign, and which Catharine I. presented to the newly-instituted society. It continued to increase, by the bounty of succeeding Czars, and, in 1802, received an important addition in the library and cabinet of Count Boutourlin, purchased by the Emperor Alexander. This collection is now open to the public two days in the week, and contains about 70,000 volumes. Some interesting particulars relating to this library may be found in the works of different authors.[3]

Libraries at Copenhagen.

There are three public libraries at Copenhagen, viz. the King's Library, the University Library, and Classen's Library. The King's Library contains 400,000 volumes of printed books, and 20,000 volumes of manuscripts. The University Library contains about 110,000 printed volumes, all collected since the year 1728, when the original library was destroyed by fire; together with 1761 Icelandic, 202 oriental, and 1228 other manuscripts, partly classical, partly connected with Danish history, besides manuscript collections of the classics. Classen's Library contains about 35,000 printed volumes, but possesses no manuscripts. These libraries, consisting of 568,000 volumes printed and manuscript, are accessible to all respectable householders, and likewise to strangers introduced by such; and, besides, the books are, under certain restrictions, allowed to circulate. The King's Library is general, and about equally complete in all the branches of human knowledge. The University Library is also to a certain extent general, but the main body of the collection has been made chiefly with reference to academical education. Classen's Library consists principally of books of geography, travels, natural history, and agriculture. The administration of these libraries seems to be equally economical and efficient, and is conducted solely with a view to public utility, which, in this case, means public instruction.[4]

Swedish libraries.

The public libraries, in Sweden are the Royal Library, situated in the northern wing of the king's palace at Stockholm, and the library called Benzielstjerna-Engeström, founded by private individuals, but to which admission is readily granted on recommendation. The Royal Library, which was founded by Gustavus Vasa, and enlarged by the liberality of succeeding sovereigns, contains 70,000 volumes of printed books, with 2500 volumes of manuscripts, besides 16,500 diplomas, and is open to the public every day excepting Saturdays, Sundays, and holidays; besides, books are lent out on respectable recommendation. The library of Benzielstjerna-Engeström contains about 12,000 volumes of printed books, and 3000 volumes of manuscripts, rich in materials for Swedish biography. Besides these, there are libraries attached to the different academies. The number of provincial libraries in Sweden, including those of the universities of Upsala and Lund, is thirteen. That of Upsala, which was founded by Gustavus Adolphus, is the largest in Sweden, and contains 100,000 printed volumes, with 600 volumes of manuscripts. A catalogue of the collection, by Professor Aurivilius, was printed in the year 1814, in two vols. 4to.[5] The library of Lund was founded at the same time as that university, by Charles X., and possesses about 40,000 volumes. These libraries are supported and increased by an annual grant from the state, and by a fee paid by each student on entering the universities. They are open every day, and each student can borrow books, on the responsibility of a professor, or of some other respectable person. In those provincial towns where large public schools, called *gymnases*, are established, there are also public libraries, to the number of about eleven in all. These libraries, which have been founded by private individuals, are kept up much in the same way as those belonging to the universities.[1]

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[1] *Essai sur un Nouveau Système Bibliographique*, § iii. *Redaction des Catalogues.* Appendix to Report, p. 461, et seq.

[2] Appendix to Report, pp. 448, 480.

[3] See Coxe's *Travels in Russia*, c. 17; Storch's *Picture of St Petersburg*; and *Voyage au Nord de l'Europe*, tom. iii. p. 212, et seq.

[4] Appendix to Report, p. 483.

[5] One of the apartments of this library contains a deposit, the supposed contents of which have excited much conjecture and speculation amongst the learned. The deposit alluded to consists of a large box, upon which stands another of smaller dimensions, both of which are secured by means of strong chains and locks. These were presented to the university by Gustavus III. with strict injunctions that they should not be opened for *fifty* years. When that period expires, which will be in the year 1842, they will probably be found to contain a history of his own time, with various documents, letters, &c.

Li ries of t Uni- ted ates of neri- ca.

In the United States of North America there are forty-three incorporated colleges or universities, of which thirty have libraries of greater or less extent, containing altogether 128,118 volumes. The largest college library is that of Harvard, which contains 30,000 volumes; and the next is that of St Mary's College, Baltimore, which possesses 10,000 volumes. Besides these, there are four colleges which have libraries to the amount of about 8000 volumes each. A catalogue of the library at Harvard College, Massachusetts, was printed in 1830, in three volumes 8vo; from which it appears that the number of books, which, in 1790, amounted to only 12,000 volumes, now exceeds 30,000, besides several thousands of tracts. The first and second volumes of this catalogue contain a list of the books in alphabetical order; and the third consists of a systematic or classed index to the alphabetical catalogue. There are several other considerable libraries in the United States, as the Public Library at Philadelphia, the Congress Library at Washington, and a few others of less note. The Loganian Library, which, in 1791, was incorporated with the Philadelphia Public Library, contained about 15,000 volumes, amongst which were many rare works in classical literature.[2]

Li ries of t East.

Oriental libraries are, in general, but limited collections, the contents of which possess little interest or value to Europeans. Their general character, however, will be most satisfactorily indicated by the description of some of them.

Tu ish lib ries.

At Constantinople there are, within the walls of the seraglio, two libraries, which were founded by Achmed III. and Mustapha III., and enriched with books acquired by themselves or their successors. These libraries contain upwards of 20,000 volumes, and are gradually increased, either by purchase, by donations made to the sultan by his grandees, or by confiscations of the effects of public officers, amongst which books are commonly to be found.[3] Much uncertainty has prevailed, and many erroneous reports have been circulated, respecting the contents of these libraries. The Abbé Sevin, who arrived at Constantinople in December 1728, failed to obtain admission into the sultan's library; and, deterred by the assurances he had received, that Amurath IV. had caused all the Greek manuscripts to be burned, he deemed any further research or inquiry to be hopeless; whilst succeeding travellers, relying on statements of a different kind, have confidently asserted that in these libraries were preserved the ancient collections of the Greek emperors.[4] More fortunate than his predecessors, however, Toderini, after three years' unremitting attempts during his residence at Constantinople, found means to procure transcripts of the catalogues of the libraries in the seraglio, through the instrumentality of a page who clandestinely copied a few lines every day.[5] From the inquiries of the learned Abbate, it appears that the merits of this double collection had been greatly exaggerated. The libraries of the seraglio are much inferior to some of those which are open to the public. Commentaries, explanations, marginal notes, and other writings on the Koran, form the subjects of the largest portion; to which succeed treatises on jurisprudence (also accompanied with notes and commentaries), on philosophy, logic, astronomy, arithmetic, medicine, and ethics. The historical works are few in number, and chiefly confined to the Ottoman empire. There are some manuscripts in the Greek, Latin, and other European languages; but no traces whatever have been discovered of the lost decades of Livy, of the writings of Homer or Tacitus, or of those parts which are wanting to complete the works of other ancient authors.[6]

Besides those of the seraglio, Constantinople possesses thirty-two public libraries, all varying in extent, but more or less celebrated for the number and value of their manuscripts, which are neatly bound in red, green, or black morocco. The Mahommedans have a peculiar method of indorsing, placing, and preserving their books. Each volume, besides being bound in morocco, is preserved from dust in a case of the same material; and on it, as well as on the edges of the leaves, the title is written in large and legible characters. The books are placed one upon another in presses ornamented with trellis-work, and are disposed along the wall, or in the four corners of the library. All these collections are open to the public throughout the year, excepting on Tuesdays and Fridays; the librarians are as polite and attentive as Turks can be, to those whom curiosity or love of study attract thither; and every one is at liberty, not merely to peruse, but to make extracts from, the books, and even to transcribe them entirely, provided this be done within the walls of the library. To facilitate literary researches, each library is furnished with a catalogue, containing the title, and giving a short account of the subject of each volume. Theology, including the Koran and commentators thereon, jurisprudence, medicine, ethics, and history, are the sciences chiefly cultivated by the Osmanlees. The books are all written with the greatest care, on the finest vellum; the text of each page is enclosed in a highly ornamented and gilt frame-work; the beginning of each chapter or section is splendidly illuminated; and the prices of the manuscripts vary in proportion to the beauty of the characters.[7] Under the reign of the present sultan, Mahmoud, the introduction of European discipline, and, to a certain extent, of European customs and manners, is fast paving the way for a still more important innovation; the introduction of European knowledge and civilization, with the subversion of those fanatical prejudices which, nurtured by ignorance and inflamed by religion, present the most formidable obstacle to the improvement of nations.[1]

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[1] *Notices sur les Bibliothèques Publiques en Suède*, Appendix to Report, p. 497, et seq.

[2] Journal of the American Education Society; Christian Examiner, Boston; Catalogue of Books belonging to the Library Company of Philadelphia, 1807, in 8vo.

[3] D'Ohsson, *Tableau général de l'Empire Ottomane*, tom. ii. pp. 487-494.

[4] It is not a little singular that Dr E. D. Clarke has made no mention whatever of the libraries of the seraglio, although he has given a detailed, and, upon the whole, picturesque description of its interior.

[5] *Catalogo della Libreria della Seraglio, trasportato da Constantinopoli a Venezia*, dall' Abbate Giamabattista Toderini, nel anno 1786, in 8vo. See also *Della Letteratura Turchescha*, tom. ii. pp. 53-81, and in Turkish at the end of the same volume.

[6] Toderini, *Letteratura Turchescha*, tom. ii. pp. 51, 53, et seq.

[7] D'Ohsson, tom. ii. pp. 488, 489; Toderini, tom. ii. p. 32, et seq.

Library of Mount Sinai.

The library of the convent of Mount Sinai was found by Mr Burckhardt to contain a great number of Arabic manuscripts, and some Greek books; but the former proved to be of little literary value; and of the latter, Burckhardt carried away two beautiful Aldine editions, a Homer, and an Anthology. The priests refused to show him their Arabic memorandum-books previous to the fifteenth century; but from those which he was permitted to inspect, he copied some very interesting documents concerning the former state of the country.[2]

Indian libraries.

Of the libraries in India, whether composed of European or of native works, the want of the requisite information prevents us from attempting to give any details. The following account of the largest library at Goa, that of the Augustinian monks, extracted from the journal of a tour made by Sir James Mackintosh, is almost the only notice of the kind that we have met with, and it is certainly by no means flattering. "The books," says he, "are about 10,000, chiefly Latin and Portuguese, with a few Spanish, a very few Italian and Greek, no French, and of course no English, and none of any other language. There are not above twenty printed since the close of the seventeenth century. There are a few bad editions of classics, but not a complete edition even of Cicero himself; a great many schoolmen, casuists, and canonists, with some jurists; very little history, scarcely any of modern times, except a little Portuguese; about ten volumes of Portuguese and Spanish poetry; no morals, but as the handmaid or rather slave of superstition; no politics, no political economy, no astronomy, no chemistry, no zoology, no botany, no mineralogy, and no book even on mathematics by Euclid. I did not know before that the world had produced 10,000 such useless and pernicious books, or that it had been possible to have formed a large library, with so curious an exclusion of whatever is instructive or elegant."[3] At the different presidencies, and in some other parts of British India, are collections, more or less extensive and valuable, of European and native productions; but they have not been particularly described. Of the native libraries of India, we know but little. That of Tippoo Sahib, which fell into the hands of the British when his capital was taken, consisted, according to Stewart's catalogue, of nearly 2000 volumes, many of them highly ornamented. In China and Japan, and likewise in the capital of the Burman empire, there are considerable collections, though of the precise nature of their contents we still remain entirely ignorant.

Having thus completed our laborious survey, which we have endeavoured to render as complete as the materials to which we have had access would admit, it now only remains to refer the reader to the article Bibliography, as containing various inquiries intimately connected with the present subject; and which may, in fact, be said to constitute the Science of those who are intrusted with the formation and superintendence of Libraries. (A.)

LIBRATION, in *Astronomy*, an apparent irregularity of the moon's motion, by which she seems to librate about her axis, sometimes from the east to the west, and at other times from the west to the east. See Astronomy, *Index*.

LIBURNIA, in *Ancient Geography*, a district of Illyricum, extending towards the Adriatic, between Istria on the west, Dalmatia on the east, and Mount Albius on the north. The people were called *Liburni*. The apparitors, who at the command of the magistrate summoned the people from the country, were called *Liburni*, because generally men of *Liburnia*.

LIBURNUS, in *Ancient Geography*, a mountain of Campania. It was also a port of Tuscany, and is now *Livorno*, or *Leghorn*. Long. 11. E. Lat. 43. 30. N.

LIBYA, in general, a term which, according to the Greeks, denoted Africa. It was derived from *Lub*, thirst, being a dry and thirsty country. See Africa.

Libya, in a more limited sense, was the middle part of Africa, extending north and west, between the Mediterranean to the north, and Ethiopia to the east. It was divided into the Hither or Exterior Libya, and the Farther or Interior. The former lay between the Mediterranean on the north, and the Farther Libya and Ethiopia beyond Egypt on the south. The Farther or Interior Libya was a vast country, situated between the Hither Libya on the north, the Atlantic Ocean on the west, the Ethiopic on the south, and Æthiopia beyond Egypt on the east.

Libya, in a still more confined sense, called *Libya Propria*, was a northern district of Africa, and part of the Hither Libya, situated between Egypt on the east, the Mediterranean on the north, the *Syrtis Major* and the *Regio Tripolitana* to the west, the Garamantes and Æthiopia beyond Egypt to the south. This Libya was again subdivided into Libya taken in the strictest sense of all, and into *Marmarica* and *Cyrenaica*. Libya in the strictest sense was the most eastern portion of *Libya Propria*, next to Egypt, with Marmarica on the west, the Mediterranean on the north, and the Nubi, now called Nubia, to the south.

LICENSE, in *Law*, an authority given to a person to do some lawful act.

LICENSER of Books, an officer without whose permission, formally granted, no book could be published. It has been proved by Beckman that such an office was established, not only in the Roman empire, but also in the states of Greece. All the copies of the works of Protagoras which could be procured were burned at Athens by the public crier, and the satirical works of Labienus shared the same fate under the reign of the Emperor Augustus. Not long after the invention of printing, laws were enacted for subjecting books to examination. See Bibliography.

LICENTIATE, one who has obtained the degree of a license. The greater number of the officers of justice in Spain are distinguished by no other title than that of licentiate. In order to pass as licentiate in common law, civil law, and physic, they must have studied seven years, and in divinity ten. Amongst us a licentiate usually means a physician who has a license to practise, granted by the College of Physicians.

LICETUS, a celebrated physician of Italy, was born at Rappollo, in the state of Genoa, in the year 1577. He came into the world in the seventh month; but his father, an ingenious physician, wrapped him up in cotton, and nurtured him so carefully that he lived to be seventy-seven years of age. He was trained with great care, became a distinguished man in his profession, and was the author of a great number of works, particularly one *De Monstris*. He was professor of philosophy and physic at Padua, where he died in the year 1655.

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[1] The publication of the Ottoman States Gazette, under the title of *Takwimi Wokai*, or Tables of Events, has proceeded with great spirit since its first appearance in January 1832, and contains a variety of articles which throw considerable light on the nature of the reforms which are in progress throughout every department of the state. In this respect, the *Takwimi Wokai* is a far more interesting paper than the *Moniteur Ottoman*, which is by no means the French original of the former, as the public may perhaps have been led to conclude.

[2] *Travels in Nubia*, p. lxviii.

[3] *Life of the Right Hon. Sir James Mackintosh*, vol. ii. p. 85, London, 1836, 8vo, 2d edition.

LICHTENBERG, a part of the duchy of Saxe-Coburg, but detached from the other territory of that state. It is situated to the west of the Rhine, surrounded by the lands of Prussia, Bavaria, and Hesse-Homberg. It extends over 248 square miles, contains two towns, ninety-six villages, 4038 houses, and 26,315 inhabitants. The capital is St Wendel, situated on the river Blies.

LICHTENSTEIN, a sovereign principality, one of the smallest in Germany. It is situated on the frontier of Switzerland and the Tyrol, and borders on the Rhine. It is fifty-five square miles in extent, and contains 1207 houses, in two towns and nine villages, with 5800 inhabitants. The revenue is said to be about L.2000 annually; but the prince has other territory, which has been mediatized, the income of which far exceeds that of the independent sovereign state.

LICHTERVELDE, a town of the Netherlands, in the province of West Flanders, and arrondissement of Bruges. It contains 4250 inhabitants, who are employed in linen manufactures.

LICINIUS Stolo, a Roman tribune, styled *Stolo* on account of a law he made, whilst tribune, that no Roman citizen should possess more than 500 acres of land; alleging, that when they occupied more, they could not cultivate it with care, nor pull up the useless shoots (*stolones*) which grow from the roots of trees. He is remembered also for having enacted, that one of the consuls should always be of a plebeian family. He lived about 362 B. C.

LICNON, in the Dionysiac solemnities, the mystical van of Bacchus, a thing so essential to all the solemnities of this god, that they could not be duly celebrated without it.

LICNOPHORI, in the Dionysiac solemnities, those who carried the licnon.

LICODIA, a city of the island of Sicily, in the kingdom of Naples, and province of Noto. It stands on a steep rock, rising above the river Dirillo, known as the Eubœa of Strabo. It is in a healthy situation, and contains 6950 inhabitants.

LICOLA, or **Lago di Licola**, a lake in the kingdom of Naples, anciently famous for excellent fish; but, in the year 1538, an explosion of a volcano changed one part of it into a mountain of ashes, and the other into a morass. It was anciently known by the name of the Lucrine Lake, the oysters of which are highly commended by Horace.

LICTORS, amongst the Romans, were officers established by Romulus, who always attended the chief magistrates when they appeared in public. The duty of their office consisted of three parts: 1. *Submotio*, or clearing the way for the magistrate they attended. This they did by word of mouth; or, if there was occasion, by using the rods they always carried along with them. 2. *Animadversio*, or causing the people to pay the usual respect to the magistrate, as to alight, if on horseback or in a chariot; to rise up, uncover, make way, and the like. 3. *Præitio*, or walking before the magistrates. This they did not confusedly, or altogether, nor by two or three abreast, but singly, following one another in a straight line. They also preceded the triumphal car in public triumphs; and it was a further part of their office to arrest criminals, and to act as public executioners. Their ensigns were the *fasces* and *securis*. As to the number of lictors allowed each magistrate, a dictator had twenty-four, a master of the horse six, a consul twelve, a prætor six; and each vestal virgin, when she appeared abroad, had one.

LIDDEL, Duncan, professor of mathematics and of medicine in the university of Helmstadt, was born in the year 1561, at Aberdeen, where he received the elementary part of his education in languages and philosophy. About the age of eighteen he repaired to the University of Frankfort, where he spent three years in a diligent application to the mathematics and to philosophy. From Frankfort he proceeded to Wratislau or Breslau in Silesia, where he is said to have made uncommon progress in his favourite study of mathematics, under the direction of a very eminent professor, Paulus Wittichius. Having studied at Breslau for the space of one year, he returned to Frankfort, and remained there for three years, giving the most intense application to the study of physic. A contagious distemper having broken out at that place, the students were dispersed, and Liddel retired to the university of Rostock. Here he renewed his studies, rather as a companion than as a pupil of the celebrated Brucæus, who, though an excellent mathematician, did not scruple to confess that he was instructed by Liddel in the more perfect knowledge of the Copernican system, and other astronomical questions. In 1590 he returned once more to Frankfort; but having there heard of the increasing reputation of the Academia Julia, established at Helmstadt by Henry duke of Brunswick, Mr Liddel removed thither; and soon after his arrival was appointed to the first or lower professorship of mathematics. From this, however, he was promoted to the second and more dignified mathematical chair, which he occupied for nine years, with much credit to himself and to the Julian Academy. In 1596, he obtained his degree in physic, was admitted a member of the faculty, and began publicly to teach physic. By his teaching and his writings he was the chief support of the medical school at Helmstadt, was employed as first physician at the Court of Brunswick, and had much practice among the principal inhabitants of that country. Having been several times elected dean of the faculties both of philosophy and physic, he had in the year 1600 the honour of being chosen protector of the university. But neither academical honours, nor the profits of an extensive practice abroad, could make Dr Liddel forget his native country. In the year 1604 he took a final leave of the Academia Julia; and after travelling for some time through Germany and Italy, he at length settled in Scotland, where he died in the year 1613, in the fifty-second year of his age. By his last will he bestowed certain lands purchased by him near Aberdeen upon the university there, for the education and support of six poor scholars. Amongst a variety of regulations and injunctions for the management of this charity, he appointed the magistrates of Aberdeen his trustees, and solemnly denounced the curse of God against any person who should abuse or misapply it. His works are, 1. *Disputationes Medicinales*, Helmstadt, 1603, 4to; 2. *Ars Medica succincte et perspicue explicata*, Hamburg, 1607, 8vo, dedicated to James VI. and divided into five books, viz. *Introductio in totam Medicinam, de Physiologia, de Pathologia, de Signorum Doctrina, de Therapeutica;* 3. *De Febribus Libri tres*, Hamburg, 1610, 12mo; 4. *Tractatus de Dente Aureo*, Hamburg, 1628, 12mo. This last production Dr Liddel published, in order to refute a ridiculous story then current, of a poor boy in Silesia, who, at seven years of age, having lost some of his teeth, produced a new tooth of pure gold. The imposture was discovered to be a thin plate of gold, skilfully drawn over the natural tooth by an artist of that country, with a view to excite the public admiration and charity. He was also the author of *Artis Conservandi Sanitatem Libri duo*, Aberdeen, 1651, 12mo; a posthumous work.

LIE, in morals, denotes a criminal breach of veracity. Archdeacon Paley, in treating of this subject, observes, that there are falsehoods which are not lies, that is, which are not criminal; and that there are lies which are not literally and directly false.

Cases of the first class are those, 1. where no one is deceived; as, for instance, in parables, fables, novels, jests, tales to create mirth, or ludicrous embellishments of a story, in which the declared design of the speaker is not to inform, but to divert; compliments in the subscription of a letter; a prisoner's pleading not guilty; an advocate asserting the justice, or his belief of the justice, of his client's cause. In such instance no confidence is destroyed, because none was reposed; no promise to speak the truth is violated, because none was given or understood to be given. 2. Where the person you speak to has no right to know the truth, or, more properly, where little or no inconvenience results from the want of confidence in such cases; as where you tell a falsehood to a madman for his own advantage; to a robber, to conceal your property; to an assassin, to defeat or to divert him from his purpose. It is upon this principle that, by the laws of war, it is allowable to deceive an enemy by feints, false colours, spies, false intelligence, and the like; but by no means in treaties, truces, signals of capitulation or surrender. The difference is, that the former suppose hostilities to continue, whilst the latter are calculated to terminate or suspend them.

As there may be falsehoods which are not lies, so there may be lies without literal or direct falsehood. An opening is always left for this species of prevarication, when the literal and grammatical signification of a sentence is different from the popular and customary meaning. It is the wilful deceit that makes the lie; and we wilfully deceive when our expressions are not true in the sense in which we believe the hearer apprehends them. Besides, it is absurd to contend for any sense of words, in opposition to usage; for all senses of all words are founded upon usage, and upon nothing else. A man may also act a lie; as by pointing his finger in a wrong direction, when a traveller inquires of him his road; or when a tradesman shuts up his windows, to induce his creditors to believe that he is abroad; for to all moral purposes, and therefore as to veracity, speech and action are the same, speech being only a mode of action.

LIEFKENSHOEK, a strong fortress of the Netherlands, in the province of East Flanders. It stands on the left bank of the Scheldt, opposite Lillo, and with it forms the chief defence of that river. It has four bastions, two ravelins, a ditch, and counterscarp, with only one gate towards the water; and the whole country on the land side can be laid under water when the defence requires it.

LIEGE (*Ligius*) properly signifies a vassal, who holds a kind of fee, that binds him in a closer obligation to his lord than other people. The term seems to be derived from the French *lier*, to bind, on account of a ceremony used in rendering faith or homage; which was by locking the vassal's thumb or his hand in that of the lord, to show that he was fast bound by his oath of fidelity. Cujas, Vigenère, and Bignon, choose rather to derive the word from the same source with *leudis* or *leodi*, loyal, faithful. But Du Cange coincides in the opinion of those who derive it from *liti*, a kind of vassals, so firmly attached to their lord, on account of lands or fees held of him, that they were obliged to do him all manner of service, as if they were his domestics. He adds, this was formerly called *litgium servitium*, and the person *litge*. In this sense, the word is used (Leg. Edw. cap. 29): *Judæi sub tutela regis ligea debent esse;* that is, wholly under his protection. By liege homage, the vassal was obliged to serve his lord towards all, and against all, excepting his father. In this sense, the word was used in opposition to simple homage, which only obliged the vassal to pay the rights and accustomed dues to his lord, and not to bear arms against the emperor, prince, or other superior lord; so that a liege man was a person wholly devoted to his lord, and entirely under his command. But it must be observed, there were formerly two kinds of liege homage; the one, by which the vassal was obliged to serve his lord against all, without exception even of his sovereign; and the other, by which he was bound to serve him against all, except such other lords as he had formerly owed liege homage to.

In our old statutes, lieges and liege people are terms peculiarly appropriated to the king's subjects; as being *liges, ligi,* or *ligati,* obliged to pay allegiance to him (8 Henry VI., 14 Hen. VIII. &c.), though private persons had their lieges too. *Reinaldus, Dei gratia, abbas Ramesiæ, præposito et hominibus de Brancestre, et omnibus vicinis Francis et Anglis salutem. Sciatis me dedisse terram Ulfe, in depedene (hodie depedale) huic Boselino, et uxori ejus Alfniæ; ea conditione quod effecti sint homines legis.*

Liege, a province of the Netherlands, formed in part out of what, before the French Revolution, was the independent ecclesiastical state of that name, and was by France divided into the departments of the Ourthe and of the Sambre and Meuse. It contains also small parts taken from the duchy of Limburg, from the county of Dahlen and the abbey of Stablo, and also of certain villages known by the name of *Terres de Redemption.* It extends in N. lat. from 49° 40′ to 50° 46′, and in E. long. from 4° 49′ to 5° 57′, and is 2255 square miles in extent. It comprehends four arrondissements, divided into nine cantons, and those into 466 communes, containing 360,000 inhabitants, who are chiefly of the Walloon race, and speak that language, though of late years the use of the French tongue has been very much extended. The face of the country in the northern part is hilly; but in the southern, the largest division is mountainous, where the Ardennes forms a considerable portion. The soil is very various. On both sides the Meuse, towards the province of Limburg, there are some plains of moderate fertility, and well cultivated; but on that part where the Ourthe joins the Meuse, and especially towards Luxemburg, the land is rocky and stony, with much slate, which last is the prevailing stone in the woody district of the Ardennes. Agriculture in the north affords moderate products, in the south very poor returns; so that an importation of corn is regularly required, though the extension of potatoes, which has taken place of late years, has diminished the demand for grain. The woods are one of the chief sources of the wealth procured from the soil, and they cover more than 200,000 acres. There are mines producing iron and coal, which, before the revolution effected in Brussels in 1830, was a great source of benefit, the former yielding employment to numerous persons in making ironmongery goods; and the latter being of vast importance when the fuel consumed in Holland was drawn by the Meuse from Liège, instead of being furnished by sea from England. Besides the iron manufactures, there are others of paper, woodwork, leather, beer, and corn spirits. The city of Liège, the capital of the province and of the arrondissement of the same name, is situated on the left bank of the Meuse, where it is joined by the Ourthe. It is in a picturesque and fertile district, in a valley of contracted extent. It is fortified, and defended by two powerful citadels on the western and northern sides. It is not well built, though there are some spacious houses and splendid churches, with pleasing promenades. It contains 8000 houses, and 48,000 inhabitants, who are chiefly employed in the fabrication of great guns and small arms, cutlery, and other iron wares. There are breweries, distilleries, and tanneries, and other branches of industry; but all have suffered severely by political occurrences.

LIEGNITZ, one of the governments into which the Prussian province of Silesia is divided, comprising the north-western part of Upper Silesia, and a part of Upper Lausatia. It extends over 4158 square miles. It comprises thirty-five cities or walled towns, and 1383 smaller towns and villages, and 713,362 inhabitants, of whom the Protestants and Catholics are nearly equal in number. The chief products are corn, fruit, and culinary vegetables, with much excellent flax. Of late years there are large flocks of sheep, the fineness of the wool of which has been improved by crosses of the better breeds. The chief industry is spinning. The capital is the city of the same name, situated on the river Katsbach, where the Blackwater falls into that stream. It is surrounded with walls, but for a promenade rather than defence; and has four gates, with an old castle. It contains two Lutheran and four Catholic churches, several hospitals and courts of law, and a gymnasium, with 780 houses, and about 11,500 inhabitants. It is a place of active manufacturing industry, producing cotton goods of various kinds, camlets, serges, and other woollens, leather, Prussian blue, lace, starch, and musical instruments, and has several breweries and distilleries. This place is remarkable for a battle fought in 1760, in which the Austrians were defeated by the Prussians. Long. 16. 7. 1. E. Lat. 51. 12. 30. N.

LIER, or Lierre, a city of the Netherlands, in the province of Antwerp, and arrondissement of Mechlin. It stands at the junction of two small streams, which, when united, form the river Neethe. It contains 10,500 inhabitants, who are industriously occupied in distilleries, breweries, oil-mills, salt-works, and in printing calicoes. Long. 4. 26. E. Lat. 51. 9. N.

LIEVENS, John or Jan, a celebrated painter, was born at Leyden in 1607. He discovered an early inclination for the arts, and was the disciple, first of Joris van Schooten, and afterwards of Peter Lastman. He excelled principally in painting portraits, but he also executed several historical subjects with great success. He came over to England, where he resided three years, and painted the portraits of Charles I., the queen, the prince of Wales, and several of the nobility; after which he returned to Antwerp, where he met with full employment for his pencil. We have several etchings by this master, which are performed in a slight but masterly manner. The chiaro scuro is very skilfully managed in them, so as to produce a most powerful effect. His style of etching bears some resemblance to that of Rembrandt; but it is in general coarser, and less finished.

LIEOU-KIEOU, or Loo-Choo. See Loo-Choo.

LIEUTAUD, Joseph, counsellor of state and first physician at the court of France, was born at Aix, in Provence, and resided principally there till he took the degree of doctor of physic. After this he prosecuted his studies for some years at Montpellier, and having returned to Aix, he soon acquired extensive practice, and became eminent for literary abilities. He resided there till the year 1750, when he was invited to act as physician to the royal infirmary at Versailles. There he practised with such reputation and success, that he soon arrived at the head of his profession; and in the year 1774, upon the death of M. Senac, he was appointed chief physician. His extensive engagements in practice did not prevent him from cultivating the science of physic in all its branches, and from freely communicating to others the result of his own studies. He published many valuable works, amongst which the following may be accounted the most remarkable, viz. 1. Elementa Physiologiæ; 2 Précis de la Médecine; 3. Précis de la Matière Médicale; 4. Essais Anatomiques; 5. Synopsis universæ praxeos Medicinæ; 6. Historia Anatomico-Medica. He died at Versailles in 1780, aged seventy-eight.

LIEUTENANT, an officer who supplies the place and discharges the office of a superior in his absence. Of these, some are civil, as the lord-lieutenants of kingdoms, and the lord-lieutenants of counties; and others are military, as the lieutenant-general, lieutenant-colonel, &c.

Lord-Lieutenant of Ireland is properly a viceroy, and has all the state and grandeur of a king of England, except being served upon the knee. He has the power of bestowing all the offices under the government, of dubbing knights, and of pardoning all crimes, except high treason.

Lord-Lieutenants of Counties are officers who, upon any invasion or rebellion, have power to raise the militia, and to give commissions to colonels and other officers, and to arm and form them into regiments, troops, and companies. Under the lord-lieutenants, are deputy-lieutenants, who possess the same power; these are chosen by the lord-lieutenants, out of the principal gentlemen of each county, and presented to the king for his approbation.

Lieutenant, in the land service, is the second commissioned officer in every company both of foot and horse, next to the captain, and who takes the command upon the death or absence of the captain.

Lieutenant of a Ship of War, the officer next in rank and power to the captain, in whose absence he is accordingly charged with the command of the ship, as also the execution of whatever orders he may have received from the commander relating to the king's service. See Navy.

LIFE is peculiarly used to denote the animated state of living creatures, or the time during which the union of the soul and body lasts. See Physiology.

Life, Duration of. See Mortality.

LIFE-PRESERVERS.

Although it too frequently happens, that an accident, which materially endangers the life of an individual, deprives him, in the mean time, of that presence of mind which alone would enable him to take proper measures for his safety; yet to have meditated, in an interval of leisure, upon the best method of proceeding in case of emergency, must tend greatly to diminish the embarrassment and confusion that commonly accompany the accident, even if it should not be thought necessary to provide any particular apparatus for the purpose of escaping the danger. There are also many ways in which those who are not immediately involved in the disaster may contribute to the preservation of life, whether actuated by interest, or by humanity only; and the modes of relief will, therefore, be naturally divided into the *internal* and the *external*, whether relating to *fires* or to *shipwrecks*.

Sect. I.—*Internal Fire-Escapes.*

Whenever a family establishes itself in a residence not detached from others, it becomes of importance to ascertain what facilities the house affords for ascending to the roof, and for passing to those of the neighbouring houses. It is scarcely possible that a conflagration should extend at once to the contiguous houses on each side, before the inhabitants of the house in question have had time to escape. But in a detached house, if there are not two or more staircases remote from each other, and even in a house contiguous to others, when there is no facility of communicating by the roof, it becomes highly expedient to provide some *internal means* of escaping through the windows in case of fire, and to have *on every floor* a good strong rope, with a hook or a loop at the end, by which it may be fastened to a bed-post, so as to enable an active person to descend by its help out of the window, finding from time to time a partial footing in the inequalities of the wall. This process will be greatly facilitated by having the rope knotted at intervals of about a foot throughout its length; the knots being nearly as convenient as the blocks or clips that are sometimes made for the purpose of retarding the descent, by holding them, and regulating the friction by the pressure of the hand[1] (Plate CCCXXIII. fig. 13); unless the clip be attached to a strong cross bar, on which a person may sit, while he regulates the position of the clip by its handles, and allows himself to descend with more or less velocity at pleasure. The arrangement for this purpose may be made by a roller, or pipe, sliding on the rope, and pushed down so as to open the handles of the clip and tighten its teeth, when the person holds by the roller and draws it down (Plate CCCXXIII. fig. 12); and, on the contrary, the clip may be opened by pressing on the handles with the other hand, or with the thighs; or any other simple mode of regulating the clip may be adopted, provided that it be not liable to be misunderstood, or misapplied, in a moment of confusion. After all, a rope-ladder would perhaps be preferable, as not being liable to be deranged; it is often kept ready made in the shops; and, in the absence of any other rope, a common bed-cord will generally be found strong enough to support the weight even of a stout man; for a quarter-inch rope may be safely trusted with two hundredweight, and ought indeed to support three times as much if new and good.

Sect. II.—*External Means of Escape from Fire.*

The external means to be employed in cases of conflagration must be provided by the managers of fire-offices, or by other public officers; and every ingenious workman, whom they may employ, will be able, at his leisure, to devise such apparatus as he can the most conveniently execute, and to give it a full trial in the absence of all danger; it will, therefore, only be advisable that he should compare for himself the particular inventions which have been suggested for this purpose, and that he should choose from among them such as he thinks most likely to do him credit; and he may, indeed, very possibly find means of improving on any of them.

1. In Leupold's *Theatrum Machinarium* (plate liv. lv.) we find the representation of a chair calculated to be drawn up or down by means of pulleys. 2. Mr Varcourt obtained, in 1761, the approbation of the Parisian Academy of Sciences for his invention of a hollow mast, fixed in a waggon, and supporting a stage, with the means of ascending and descending. (*Hist.* p. 158.) 3. In the beginning of the present century, a fire-escape of Mr Audibert was approved by the Parisian Institute. (*Mém. Inst.* iv.) 4. A committee was also appointed for examining several similar inventions at the Lyceum of Arts, and a medal was awarded by it to Mr Daujon, for his apparatus, which consists of a platform carried on wheels, supported by three frames, with brass wires, on which boxes are made to slide up and down for the conveyance of persons or of furniture. (*Annales des Arts*, *Repertory* ii. vol. i. p. 439.) 5. Mr Collins's invention of pipes raised by ropes, and affording a centre to a long lever, is described in the fourth volume of the *American Transactions*, and in the *Repertory* (vol. xv. p. 35). 6. In the thirty-first volume of the *Transactions of the Society of Arts* (for 1813, p. 244), we have an account of a fire-escape invented by Mr Adam Young, for which he received a medal from the society. It appears to constitute by far the most portable of ladders, consisting of cross bars or rounds, connected by ropes, and having their ends fitted together, so as to form a pole, which is readily elevated to the window; and the rounds being separated, and the hooks at the end properly fixed to the window-frame, the whole forms itself into a very convenient ladder of a mixed structure. 7. The thirty-fourth volume, for 1816 (p. 227), contains a description of Mr Braby's fire-escape, consisting of a car made to slide on a strip of plank fixed to a pole, and governed by a rope, which is cased with iron, to protect it, in case of necessity, from the effect of the fire.

The modes of extinguishing fires are not precisely the objects of the present inquiry; but it deserves to be remarked, that the only rational principle on which the methods proposed have been founded, is that of cutting off the supply of air, either by a coat of water or steam, or by means of some chemical substance, capable of forming an impenetrable varnish, or glazing, on the surface of the combustible materials. A mixture of clay, with sulphate of iron and alum, has been proposed for this purpose; but its utility must obviously be extremely limited, and it must require to be applied with great address, so as to be brought into fusion exactly at the place where it is capable of protecting the substances not yet consumed.

Sect. III.—*Internal Means of Escape from Shipwreck.*

The means of escaping from shipwreck may be similarly divided into internal and external, or into the precautions to be taken by the ship's company, and the measures to be adopted by persons on shore. The internal means depend either on enabling the individuals to swim or float, or establishing a connection with the shore by ropes; and of the former, we may first consider those which require no particular preparation before the occurrence of the accident that calls them into action, and which are therefore the most universally applicable.

Of such expedients, the most effectual appear to be those which depend on the employment of empty water-casks for assisting the ship's company to drift on shore. 1. A paper on the arrangement of water-casks, to serve as floats in case of shipwreck, appears in the publications of the Society for the Improvement of Naval Architecture, dated in 1796 (vol. ii. 1, p. 51). 2. In 1818, Mr Grant of Bideford obtained a gold medal from the Society of Arts, for the invention of a life-preserver, consisting of a thirty-six gallon cask, with some iron ballast fixed on a wooden bed, and lashed to the cask, and with ropes round it for the men to hold; and it was found that ten men were supported by it with convenience in tolerably smooth water, the bung of the cask being well secured by cork (vol. xxxvi. p. 63.) The ballast could be of very little use, and a cask simply tied round with a rope, like a common parcel, would probably answer the purpose equally well. It would, indeed, be prudent for every ship in a storm on a lee shore, to have a few of her casks well emptied and stopped, and tied in this manner, before the actual occurrence of imminent danger. 3. In the thirty-seventh volume of the *Transactions of the Society* (p. 110), there is an account of Mr Cook's life-raft, consisting of a square frame with canvass nailed across it, supported by a cask at each corner, for which the gold medal was voted to him. 4. It is followed by a description of Lieutenant Rodger's life-raft (p. 112), which obtained a similar compliment. This raft has the advantage of requiring only such materials as are usually found on board of every ship; capstan bars, boat-masts, yards, or any other spars of moderate dimensions, which are tied together so as to make a sort of waggon frame, with a large cask fixed on each side; it appears to afford a very convenient support to the men, but it can scarcely possess any great strength for resisting the force of the breakers.

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[1] Emerson's *Mechanics*, fig. 228, 229; Leupold's *Theatrum Machinarium*, plate liv.

Mr J. Bremner, a clergyman in the Orkneys, had received a medal from the Society in 1810, for his method of converting any ship's boat into a life-boat, by putting into it three or four casks attached to the keel, which is to have a ring-bolt fixed in it for receiving the ropes by which the casks are fastened; he gives particular directions for making all the necessary arrangements, in the twenty-eighth volume of the *Transactions* (p. 134); he particularly advises that no use should be made of the natural buoyancy of the cavity of the boat, but that the bottom should be perforated without hesitation, wherever the hole would afford any additional facility for fixing a rope. Captain Manby's jolly-boat, fitted as a life-boat, "at the expense of three pounds," seems to be comprehended among those preparations which are to be made previously to the voyage.

The buckling a soldier's canteen on his breast, as an assistance to enable him to float, belongs to those temporary expedients which may occasionally be employed with advantage. Tying a hat in a pocket-handkerchief, and holding it as a float, has been recommended by Mr Lawson in the *Philosophical Magazine* (vol. xx. p. 362); he advises that the crown of the hat should be held downwards, and observes that a stick may be employed, to enable us to use two or four hats at once; but this method can only be adopted when the accident occurs in very still water.

The first and most obvious *preparation* for enabling a person to float, is the learning to swim. It is well known that swimming is scarcely ever sufficient to enable a seaman to reach the land from a ship that has been wrecked, without some assistance; and many have certainly been drowned from depending too much on their own strength; but for a momentary support, and to afford courage and presence of mind to seek for other aid, there is no question but that the faculty of swimming possesses an inestimable advantage. A boy generally learns to swim by the help of his schoolfellows, better than by any general rules, and more agreeably than in a school of natation; but it may be of some use to observe, that the act of diving to the bottom and re-ascending, in tolerably shallow water, is much more easily performed by a beginner than that of simply supporting himself on the surface; and when he has thus acquired the feeling of the immediate effect of his arms in propelling and sustaining him, he soon finds out the means of employing his feet in their assistance. The art of swimming has, however, been systematically treated by Bachstrom, *Kunst zu Schwimmen*, 8vo, Berlin, 1742; by Thévenot, *Art de Nager*, Paris, 1711; and by Bernardi, *Arte Ragionata del Nuoto*, 2 vols. 4to, Naples, 1794.

It is easy to convince ourselves, by trials in a warm bath, without reference to Robertson's experiments (*Phil. Trans.* 1757), that a substance possessing a very small degree of buoyancy is sufficient to enable the human body to float without effort. In fact, when the chest is fully expanded, the thinnest and most bony person will commonly float in sea-water; but the effort of keeping the chest expanded is as fatiguing as any other muscular exertion; and when the chest collapses, the fattest people may be in danger of sinking, unless they have learned to swim. Sir William Hamilton, indeed, tells us that, in 1783, "a woman of Scilla, four months gone with child, was swept into the sea by the wave" accompanying the earthquake, "and was taken up alive, floating on her back at some distance, nine hours after; she had been used to swim; her anxiety and suffering, however, had arrived at so great a pitch, that just at the time that the boat which took her up appeared, she was trying to force her head under water, to put a period to her miserable existence."

In China, a frame of bamboo surrounding the person is used for a float, and the lightness and strength of this substance must make it extremely proper for the purpose; sometimes also a gourd is tied to a child, to secure its floating in case of accident. The inflated goat-skins used from time immemorial by the Arabs, or the seal-skins employed by the Chilians, have the disadvantage of being easily punctured by a rock or a spar; an objection which is also more or less applicable to all substances containing air; for example, to the air jackets described in Leupold's *Theatrum Pontificium*, published about 1724. A float of a semicircular form was recommended by Ozanam, the author of the *Recreations;* and Bachstrom, in his *Art of Swimming*, proposed to float a troop of cavalry, by fixing cork to the saddles. The cork jacket of Gelacy is described in the *History of the Parisian Academy of Sciences* for 1757, and Lachapelle's *Scaphander*, which is considered an improvement on it, in the volume for 1765. In the year 1764, the attention of the British public was particularly called to the floating powers of cork, by some experiments which were made with cork jackets on the Thames, together with some comparative experiments on air jackets; and Dr Wilkinson, in the *Philosophical Transactions* for 1765, describes some experiments by which he ascertained that about a pound of cork was amply sufficient to enable a man of ordinary size and make to float without effort. It is almost superfluous to enumerate the multitude of trifling variations that have been made in the arrangements of cork jackets and air jackets, apparently for the purpose of exciting a momentary interest, though possibly from the best motives. Mr Bosquet advised a bag of cork shavings to be kept in readiness by each person; the *Seaman's Friend* was composed of two pieces of cork, united by straps; the *Collinetta* was a hollow vessel of copper, divided into cells; a "marine spencer" has been described by Mr Spencer, in the sixteenth volume of the *Philosophical Magazine*, consisting only of a number of old corks, arranged so as to form a girdle; and in 1806, Mr T. C. Daniel obtained a gold medal from the Society of Arts, for the invention of an apparatus of waterproof leather, surrounding the body, which, according to the testimonials he produced, had saved the lives of some persons who had been sailing in a pleasure-boat on a river. In smooth water, it has been suggested that throwing a foot-ball, with a small weight tied to it, to the person immersed, would often afford sufficient assistance; and, with respect to floating, there is no doubt that any of the assistances which have been proposed would be sufficient if they were at hand; but there is another object, to which it is necessary to attend, in cold, and even in temperate climates, that of supporting a temperature compatible with life and health, if the immersion is likely to be of long duration; and an additional provision of worsted stockings, jackets, and trowsers, will be almost as essential, in such cases, as the means of obtaining buoyancy.

For the second object which is desirable to a ship in distress, that of obtaining a safe communication with the shore, it has been usual of late years to rely principally on the humane exertions of persons who may be on the coast, and who may have made preparations for this purpose; and with this view, some instructions for properly co-operating in the measures to be adopted with Captain Manby's apparatus, have been liberally distributed to all ships when they received their papers from some of the

British custom-houses. There are, however, some simple expedients which may be adopted for this purpose by persons on board of the ship; for example, the making a kite with a pocket-handkerchief stretched over a hoop, and causing it to carry a cord to the lee shore, by means of which a stronger line, and at last a hawser, may be drawn by persons standing on the beach. A line may also sometimes be carried on shore by a cask, allowed to drift before the wind; and a bag has been recommended to be attached to such a cask, or to a buoy, in order to act as a sail, and to insure its crossing the surf. Mr Cleghorn was also rewarded, in 1814, by the Society of Arts, for the invention of a buoyant line, having a heart of cork, to obviate the inconvenience which would arise from its sinking and being dragged on the stones under the breakers; but he observes, that in heavy storms there is generally a current along shore, which renders the method almost impracticable. (*Transactions*, xxxii. p. 181.) A Mr Wheatley assures us, in Captain Manby's *Essay*, that his own life, and that of eight other persons, were saved, in 1791, by a lead line, which was carried on shore by a Newfoundland dog that he happened to have on board, when two good swimmers had been drowned in the attempt to swim on shore. It had occurred to Lieutenant Bell, in 1791, that a rope might be thrown from a ship which had struck, by means of a mortar carrying a heavy shot, and upon the principle of the gun harpoon; and he showed the practicability of the suggestion by an actual experiment, in which a deep-sea line was carried to a distance of about 400 yards. (*Trans. Soc. Arts*, xxv. p. 136.) He recommended that every ship should be provided with a mortar capable of carrying such a shot, and observed that it might be placed on a coil of rope to be fired, instead of a carriage. The line was to be coiled on handspikes, which were to be drawn out before the mortar was fired. In 1792 he received a premium of fifty guineas from the Society of Arts (*Transactions*, x. p. 204); and he obtained his promotion in the Ordnance as an acknowledgment of his merits. The shot was to weigh about sixty pounds or more, and the mortar five or six hundredweight. The experiments of the French artillery at Lafere were subsequent to those of Mr Bell, though they have sometimes been quoted as the first of the kind.

It has, however, generally been thought impracticable to manage a mortar with effect under the circumstances of actual shipwreck; and Mr Trengrouse has preferred a rocket, as more easily fired, and as having a smaller initial velocity than a shot, so that the rope would be less in danger of being broken by the impulse. He found that a rocket of eight ounces carried a mackerel line 180 yards, and a pound rocket 212; and in some experiments made under the inspection of the Society of Arts, a rocket an inch and a quarter in diameter carried a cord across the Serpentine River in Hyde Park. The musket is provided with a valve, to prevent the escape of the materials of the rocket, and it is to be fired with a little powder, without wadding. The whole apparatus is packed in a chest, containing from eight to twelve rockets, the musket, a life-spencer, a chair to traverse on a rope, a canvass bag, and a ball of wood to throw to a person swimming. Mr Trengrouse was complimented with a medal from the Society of Arts in 1820. (Vol. xxxviii. p. 161.)

Sect. IV.—*External Means of Escape from Shipwreck.*

The means to be employed by persons on shore, in cases of shipwreck, depend either on projecting a line over the ship, or on the use of a life-boat. Mr Bell had cursorily observed, that a line might be carried over a ship from the shore by means of his mortar; but for the actual execution of this proposal, in a variety of cases, we are indebted to the meritorious exertions of Captain G. W. Manby, whose apparatus, according to the report of a committee of the House of Commons, dated in March 1810, appears "to be admirably adapted to its purpose, and to have been attended with the fullest success in almost every instance." In consequence of this report, Captain Manby was thought worthy of a parliamentary reward; and he afterwards published a description of his inventions, under the title of *An Essay on the Preservation of Shipwrecked Persons*, 8vo, London, 1812. He had previously received a gold medal from the Society of Arts in 1808. (*Transactions*, xxvi. p. 209.) His success makes it expedient to extract from his *Essay* a detailed description of the apparatus, and it will be easy to make it somewhat more intelligible by a slight alteration of the order of arrangement.

P. 21. "The method of affixing a rope to a shot, for the purpose of effecting communication, when projected from a piece of ordnance over a stranded vessel, was at length succeeded in, by introducing a jagged piece of iron, with an eye at the top, into a shell, and securing it by filling the hollow sphere with boiling lead; and in another way, by drilling a hole through a solid ball, and passing a piece of iron, with an eye to it, as before described, to the bottom, where it should be well secured by riveting." (Plate CCCXXIII. fig. 22.)

"To produce the means of connecting a rope to a shot, and prevent its being burnt, and rendering it '*irresistible*' to the powerful inflammation of gunpowder, was the labour of infinite time, and the number of experiments to accomplish it is beyond all possible conception. Chains in every variety of form and great strength breaking, proved that it required not only an elastic, but a closer connected body. At length, some stout platted hide, woven extremely close to the eye of the shot, about two feet in length beyond the muzzle of the piece, and with a loop at the end to receive the rope, happily effected it." (Plate CCCXXIII. fig. 14.)

"This method is certainly desirable, as the rope may, immediately [as] it is required, be affixed to the loop, and applied in service. The form of the platted hide may likewise be woven by twisting it in the manner that the lashes of whips or ropes are spun; there is another method, by passing the rope through a case of leather, taking the greatest care that it is so well secured at the eye of the shot, as to leave no room for the SLIGHTEST PLAY, as is represented by the following BARBED SHOT." (Plate CCCXXIII. fig. 21.)

"When the crews of the distressed vessel are incapable of availing themselves of the benefits arising from communication, they having previously lashed themselves in the rigging to prevent being swept away by the sea, which is repeatedly breaking over them, and when, from long fatigue and the severity of the storm (on which occasions it too frequently occurs), they totally lose the use of their limbs, and are rendered incapable of assisting themselves in the slightest degree—the advantages of this shot are, that, on its being projected over the vessel, and the people of the shore hauling it in, it firmly secures itself on some part of the wreck or rigging, by which a boat can be hauled to the relief of the distressed objects; and by the counterbarbs it is rendered impossible [that it should] give up its hold, or slip, while that part of the wreck remains to which it has secured itself.

"Among the many that have been saved by this shot, the following are testimonials of a few of the cases: We, the crew of the brig Nancy of Sunderland, do hereby certify, that we were on board the said vessel when she was stranded on the beach of Yarmouth, on Friday morning, the 15th of December 1809, and compelled to secure ourselves in the rigging to prevent being swept away, the sea running so high over the vessel. And we do farther declare and certify, that Captain Manby, firing a rope with a hooked shot, securely holding on the wreck, enabled a boat to be hauled from the shore over the surf to our relief, otherwise we must inevitably have perished." This certificate is attested by six signatures.

P. 27.—"Facilitating communication is at all times of importance; but when the stranded vessel is in momentary danger of going to pieces, this point becomes a consideration of extreme urgency. I feel a persuasion that this particular service can only be carried into effect by a small and light piece of ordnance, the range of which is consequently very inconsiderable, when compared with that of a large and heavier piece, as it is weight alone that conveys the rope. In order, therefore, to increase the powers of a shot projected from a small mortar, its natural form must be varied, so as to give it additional 'preponderance.' The following shape, in the form of a pear, has been used with the greatest success; for, by the increased weight, the shot's momentum and power over the line is in consequence considerably augmented in its range; and when made to fit the piece as close as possible, a great increase of velocity is likewise produced from that decrease of windage." (Plate CCCXXIII. fig 11.)

"Portability in the construction of a piece of ordnance (as just described) is the very essence of this service; and communication with the stranded vessel or wreck may be effected with a cord, by which cord a rope can be conveyed, and by that rope a hawser or cable sent to the distressed vessel; for this purpose the following was constructed." (Plate CCCXXIII. fig. 18.)

P. 31.—"A person completely equipped with every necessary apparatus to effect communication with a vessel driven on a lee-shore.....the horseman, fully equipped, travelled a mile and a half, the howitzer was dismounted, and the line projected 153 yards, in six minutes.

"The application of a small piece of ordnance (Plate CCCXXIII. fig. 17) likewise offers particular advantages, capable of being employed from a boat to go to the assistance of a vessel grounded on a bar when running for a harbour, the necessity of which repeatedly occurs, and was twice witnessed at Blakeney on the 10th of November 1810, when boats endeavoured to go to their relief, and were enabled to get out of the harbour on the ebb tide, within twenty yards of the vessel; but it was found impossible to approach them nearer. Had such boats been provided with a piece of this description, and the same firmly secured on a stout piece of plank, by the holes left at each corner of the iron bed, they might have projected a small rope, coiled in a crate or basket made to the form of the bow of the boat, and the persons in the boat, so provided, would not have remained the distressed spectators of the untimely end of their fellow-creatures, without being able to afford them the smallest relief, although so little was then wanted for that desirable purpose."

"Although advantages have been pointed out in the use of these small mortars, it is necessary to be kept in remembrance, that they are produced for particular services, as the nature of the coast, and circumstances attending the distressed vessel, will direct what piece is best adapted to the undertaking. To enable the mind to form a judgment what can be effected by other pieces, the following are the minutes of experiments made with a five and half inch brass mortar, stating the quantity of powder used, and distance the ropes were projected against a strong wind, at the angle of seventeen degrees (elevation): weight of the mortar and bed about three hundred.

Ounces of Powder.	Yards of inch and half Rope.	Yards of Deep-sea Line.
4	134	148
6	159	182
8	184	215
10	207	249
12	235	290
14	250	310

"With a short eight-inch mortar, the weight of which and bed was supposed to be about seven hundred; the angles of elevation uncertain.

Ounces of Powder.	Yards of Deep-sea Line.	Yards of two-inch patent Sunderland Rope, capable of hauling the largest Boat from a beach.
32	439	...
32	479	...
32	...	336

P. 15.—"*Directions for using the Apparatus.* When the rope (which should be pliant and well stretched) is brought on the beach or cliff opposite to the stranded vessel, the most even spot, and free from projecting stones, should be selected to lay it on, and great care be taken that no two parts of it whatever overlay or even touch each other, nor must it be laid in longer lengths than of two yards. But to project a small line or cord, it will be necessary, if it is required, to contract the faker to half a yard at most, to avoid the jerk received at the end of each right line. The best method, with such a description of cord, is to lay it on the ground in the most short and irregular windings, to relieve it from this powerful impulse. To prove the effect of the impulse on a rope, if it is faked in lengths of ten or fifteen yards, it will break each time, as it then becomes a most powerful pendulum. These precautions are absolutely necessary to the success of the service.

"The following has, after various trials, been found a certain method of laying the rope, and placing it into compartments." (*French Faking,* Plate CCCXXIII. fig. 1.)

"A particular attention to this mode will never fail with a good rope, when the impediments are removed that might otherwise obstruct its rapid flight. Its advantages are, that it will allow the eye rapidly (yet correctly, *just before firing,* which is absolutely necessary) to pass over the different compartments, and at once discover if any fake has been displaced by the storm, or by any other casualty or accident come in contact with another part, which would destroy its application by the rope breaking.

"It may likewise be coiled in the manner used in the whale fishery, *whale lair* (Plate CCCXXIII. fig. 5); and in the following method, *chain faking* (Plate CCCXXIII. fig. 4).

"It is, however, necessary to add, that great attention is required in laying it agreeably to the two latter methods, arising not only from the arm being liable to get under certain parts of the rope, and thereby displace it, but from the great anxiety of mind natural on these occasions, where the lives of fellow-creatures are literally dependent on the correctness with which the rope is laid; it is therefore extremely difficult, in a moment of agitation, to determine whether any overlay has taken place, an error that would infallibly destroy every endeavour, and occasion even the fate of those whose lives we might be exerting ourselves to preserve. Could persons in the performance of this service be always collected, the two latter methods would have a decided advantage over the first mode of faking, they being laid in a much less space of time.

"As all these methods of laying the rope occupy time to place it with the care necessary; and as it has repeatedly happened that vessels, very soon after grounding, have gone to pieces, and all hands perished; it was necessary to produce a method of arranging the rope, so that it could be immediately projected as soon as it arrived at the spot; and none proved so effectual as when brought ready laid in a basket." (Plate CCCXXIII. fig. 20.)

"In this case, the rope should be most carefully laid in alternate tiers or fakes, no part of it overlaying, and it should be well secured down, that in travelling it be not displaced. But, above all things, no mistake must happen in PLACING THE BASKET PROPERLY. For example, that the end of the basket, from which the shot hangs in the above plate, should be previously marked, as it is here represented, and must be placed towards the sea or wreck, that the rope be delivered freely, and without any chance of entanglement. It will be scarcely necessary to add, there will be several tiers of the rope when laid. The utmost care and attention are required in laying the rope in tiers with strict regularity, to prevent entanglement."

P. 36.—"The next is the application of the mortar. If the wind is sideways to the shore, it must be pointed sufficiently to windward to allow for the slack of the rope lighting on the object, as the rope will, of course, be considerably borne to leeward by the effect of a strong wind, and by its being laid at a low elevation insures the rope falling against the weathermost part of the rigging. While this service is performing, great care should be taken to keep the mortar dry; nor should it be loaded until every thing is ready; when that is done, it should be primed; but as it would be impossible to do it with loose powder in a storm, a tube is constructed in the simplest manner, of common writing paper (the outer edge being cemented with a little gum) in this form (Plate CCCXXIII. fig. 2.) It is filled with meal gunpowder, made into paste with spirit of wine; when in a state of drying, run a needle through the centre, and take care the whole is left open, for, on the tube being inflamed, a stream of fire darts through the aperture with such force as to perforate the cartridge. The mortar should then instantly be fired; and in order to lessen a difficulty that has often occurred in performing this service, a pistol may be used, having a tin box over the lock, to exclude the effect of wind or rain on the priming; and the muzzle being cut [obliquely], dilates the inflammation, so as to require but little exactness in the direction of the aim.

"We will suppose the communication to be secured, although it is scarcely necessary to offer any other assistance than that of a rope, as the inventive genius of a sailor will supply every thing else; yet I could expect the people on shore to get a boat ready for meeting the vessel when driven on a beach: it is the promptest and most certain method of relief, as well as the most easy to be accomplished; for by hauling her off with the rope projected, the boat's head is kept to the waves, and not only insures safety by rising to the surge, but prevents her upsetting."

Again, p. 59.—"When the rope attached to the shot (not having barbs to it) is fired over the vessel and lodges, let it be secured by those on board, and made fast to some firm part of the rigging or wreck, that they may haul off a boat by it; but should there not be any boat, then haul on board by the projected rope a larger one, and a tailed block, through which a smaller rope is rove. Let the large rope be made fast at the mast-head, between the cap and the top of one of the lower masts, and the tailed block a little distance below it; but, if the masts should have been cut or carried away, then it must be made fast to the loftiest remaining part of the wreck. When this is done, there will be supplied from the shore a cot, hammock, netting, basket, hoop, or any of the numerous resources of seamen, which will run on the larger rope, and be worked by the people on shore. If a cot be used, the men may be so securely fastened to it as to preclude all possibility of falling out, and then be brought from the wreck, one by one, in perfect safety."

P. 47.—"While communication is gaining, three stakes should be driven into the ground in a triangular position, so as to meet close at the heads to support each other. As soon as communication has been effected by the crew of the vessel, and they have secured the line attached to the shot, made fast to these stakes, and the crew will haul on board by it a large rope and a tailed block, through which a smaller rope is to be rove, both ends of which (the smaller rope) are to be kept on shore. When they have secured these on board, and the larger rope is rove through the rollers, let a gun-tackle purchase be lashed to it, then lash the purchase to the stakes. By the means of the purchase, the larger rope may be kept at a fit degree of tension; for, if care be taken to slacken the purchase as the ship rolls out to sea, the danger of the rope being broken will be guarded against; and, on the other hand, if the purchase be gathered in as the ship rolls toward the shore, the slackness of the rope, which would prevent the cot traversing as it ought to do, and plunge it in the water more than it otherwise would, will be avoided." (Plate CCCXXIII. fig. 9.)

P. 59.—"Supposing neither boat nor cot apparatus at hand, first cast off the shot from the projected rope, and with a close hitch, thus (Plate CCCXXIII. fig. 16), let it be put over the head and shoulders of the person to be saved, bringing it close under each arm, drawing it tight, OBSERVING PARTICULARLY THE KNOT IS ON THE BREAST-BONE; for, by having the knot in that position, on the people of the shore hauling the person from the wreck, he will naturally be on his back, consequently, the face will be uppermost to seize every moment for respiration, after each surf has passed over the body. If circumstances compel recourse to this method, care must be taken to free the rope from any part of the wreck, and to jump clear away; but should there be more than one on board, each man should make himself fast in the same way, about four feet from the other, and join hands, all attending to the same directions."

P. 61.—"*For giving Relief to Vessels Stranded on a Lee Shore in a Dark and Tempestuous Night.*. It will be requisite, first, to devise the means of discovering precisely where the distressed vessel lies, when the crew are not able to make their situation known by luminous signals; secondly, to produce a method of laying the mortar for the object, with as much accuracy as in the light; thirdly, to render the flight of the rope perfectly distinguishable to those who project it, and to the crew on board of the vessel, so that they cannot fail of seeing on what part of the rigging it lodges, and consequently have no difficulty in securing it."

"To attain the first object, a hollow ball was made to the size of the piece, composed of layers of pasted cartridge paper of the thickness of half an inch, having a lid on the top to contain a fuze (Plate CCCXXIII. fig. 3), and it was then filled with about fifty luminous balls of star composition, and a sufficient quantity of gunpowder to burst the ball and inflame the stars. The fuze fixed in the ball was graduated, to set fire to the bursting powder at the height of 300 yards. Through the head of the fuze were drilled holes, at equal [distances], to pass through them strands of quick match, to prevent the possibility, from any accident of the match falling out, or from its not firing the fuze.

"On the stars being released, they continued their splendour while falling, for near one minute, which allowed ample time to discover the situation of the distressed vessel.

"During the period of the light, a stand, with two upright sticks (painted white, to render them more discernible in the dark), was ready at hand, and pointed in a direct line to the vessel." (Plate CCCXXIII. fig. 6.)

"A shell, affixed to the rope, having four holes in it, to receive a like number of fuzes (headed as before described), and filled with the fiercest and most glaring composition, which, when inflamed at the discharge of the piece, displayed so splendid an illumination of the rope, that its flight could not be mistaken." (Plate CCCXXIII. fig. 24.)

P. 66.—"*To get a Boat from a Beach over the Surf.* The importance of going to the relief of ships in distress at a distance from the land, or for taking off pilots, was viewed as of the highest consequence by the Elder Brethren of the Trinity House, and offered to my particular attention by several distinguished characters. After numerous experiments to accomplish it in various ways, the mode following was most approved. About forty fathoms of two and a half inch rope, made fast to two moving anchors, was laid out parallel with the shore, at a distance beyond the sweep of the surf; to the centre of this rope was made fast a buoy, of sufficient power to suspend the great rope, and prevent it from chaffing on the sand, rock, or stones, as well as embedding, a circumstance that has rendered it impossible, on a sandy or shingly coast, to heave out an anchor with a rope to it from the shore. As this service should be performed in fair weather (to be prepared for the storm), it may be regulated with the greatest exactness, and should take place at the top of high-water, that the upper part of the buoy may be at the full stretch of its power, and only seen at that time. (Plate CCCXXIII. fig. 8.)

"Should the shore be extremely flat, it will be desirable to place another set at a sufficient distance beyond the first, to insure the operation of this method in any state of the tide."

P. 71.—"The royal mortar being brought to the spot, is to be pointed in the direction for the buoy, and should be laid at a very low elevation, but such as to insure the range; for the more it is depressed, the less slack of rope there will be from the parabola formed in the shot's flight; the basket with the rope ready laid (having a barbed shot to it) is to be placed in the front of the mortar; on its being fired, instantly haul the slack of the rope in, to prevent the effect produced on it by a strong tide. Which being done, let the remainder be gently hauled in, to insure the shot's grappling with the great rope; when that is caught and hooked, a power will be acquired fully adequate to the service. (Plate CCCXXIII. fig. 15.)

"As a cast-iron anchor appears particularly adapted to this method, and would be much cheaper than hammered, the following is a plan of one which the Honourable the Navy Board approved, and allowed me to cast at their expense, for the purpose of making the experiment." (Plate CCCXXIII. fig. 19.)

P. 43.—"When a vessel is in that extreme and perilous situation, driven under a rugged and inaccessible cliff, and in danger of going soon to pieces, the most prompt method I should suggest is, by lowering to the crew a rope with stiff loops spliced into it, at the distance of a foot and a half from each loop, of sufficient size to contain the foot, by which they can ascend as a ladder. (Plate CCCXXIII. fig. 7.)

"This rope ladder is capable of being projected; and one of an inch and half rope was thrown from a mortar 194 yards. It might also, from the simplicity of its structure, be extremely useful in escaping from a house on fire. By making one end fast to the leg of a bed or a table, the person would come down from the window in safety, and with much less difficulty, and quicker, than with the common rope ladder, which is heavier and more unwieldy. It has great advantages when employed in saving shipwrecked men in situations just described, when, from extreme cold, and almost benumbed limbs, it would be impossible for them to climb up a rock, or ascend it even by the aid of a common rope. The holds, thus spliced in, will support both hands and feet."

The Report of the Committee of the House of Commons contains also a paper of instructions for the managers of Captain Manby's apparatus on shore, which are somewhat more minute than the directions published in his Essay. For example (p. 13)—

"If the wind be sideways to the shore, the mortar must be pointed sufficiently to windwards to allow for the slack of the rope lighting on the object, as the rope will, of course, be borne considerably to leeward by the effect of a strong wind."

"The distance your judgment decides the vessel to be from the shore, should regulate the charge of powder as stated in the scale,—taking just a sufficient quantity to clear the object: an attention to this will be more certain of your effecting communication, and guarding against the danger of the rope breaking, or any other circumstance that might prevent the successful performance of the service. The elevation of fifteen degrees is to be preferred, particularly if the wind is sideways, pointing the mortar sufficiently to windward, as the rope would then fall against the weathermost part of the rigging of the stranded vessel."

"When a vessel is driven on shore in the night, you will flash gunpowder as often as convenient on your way; this will animate the crew, and denote to them you are coming to their assistance. On getting to the spot where you have reason to suspect the vessel lies, as you are not able to discover her from the extreme darkness, and if the people on board cannot [make known] their situation by luminous signals or noises (which they will be directed to make if possible), you will lay the mortar at a very high elevation, and fire a light ball."

"Just before you fire (the rope) it would be advisable to let off a blue light to put the crew on their guard, to look out, and be ready to secure the rope. The service can be performed with a carronade."

In p. 15, chap. iv. we have a copy of directions to persons on board vessels stranded on a lee shore, proposed to be delivered to the masters at the custom-house. It is observed, that even snapping a pistol, when the powder is wet, may sometimes afford a signal visible on shore, from the sparks of the steel alone. The other parts of the directions will be easily supplied by those who understand the principles of the proposed mode of relief.

Life-boat.

The last description of the inventions to be considered with regard to the preservation of lives, in cases of shipwreck, is that of life-boats which are of such a construction as to be incapable of sinking even when filled with water. The occasional adaptation of the common boats of the ship to such purposes, by means of empty casks, has been already considered. But the boats now in question are supposed to be kept on shore at proper stations, and manned by active persons, who are in the habit of exerting themselves for the relief of seamen in distress.

Mr Henry Greathead, of South Shields, received a gold medal and fifty guineas from the Society of Arts in 1802, and a parliamentary reward of L.1200, besides further remunerations from the Trinity House, and from Lloyd's Coffee-House, for his invention of a life-boat, which is described in the *Transactions of the Society*, vol. xx. p. 283. The length of this boat is thirty feet, its breadth ten, and its greatest depth about three, besides a general curvature which nearly doubles the depth, as reckoned from the ends; the convexity below being intended to give it a greater facility of turning, and a greater power of mounting on the waves without submersion of the bow, which would increase the resistance, though it would not sink the boat; the breadth is also continued further than usual fore and aft, in order to contribute to the same property. The gunwale projects some inches, and the sides below it are cased with pieces of cork, amounting in the whole to seven hundredweight, which are secured by plates of copper. There are ten short oars of fir, fixed on pins to the gunwales, and a longer oar for steering at each end, both ends of the boat being alike. It is painted white, in order to be more conspicuous; and a carriage is provided, for conveying it over land when required. The description is accompanied by documents of the preservation of two or three hundred men by the boats of South Shields and North Shields, which were built in 1789 and 1798 respectively.

Mr Christopher Wilson received a gold medal in 1807, for a life-boat with air gunwales, which was tried at Newhaven, and was said to be lighter and more manageable than Mr Greathead's. (*Transactions*, xxv. 55.)

"Little is required," says Captain Manby, p. 73, "to establish the importance and advantages that will result from giving every boat the properties of a life-boat, particularly when taken into consideration that it can be produced at a very trifling expense."

To illustrate the method of giving the properties of preservation to any boat, I have selected the representation of a man of war's jolly boat, fitted up to make experiments thereon, by permission of the Honourable Commissioners of the Navy Board. (Plate CCCXXIII. fig. 23.)

"To give it buoyancy, empty casks were well lashed and secured in it. For the advantage of keeping it in an upright position, launching from a flat shore, beaching, and to resist upsetting, it had billage boards of equal depth with the keel, and when a good sized piece of iron or lead was let into or made fast to the keel, if any accident did upset the boat, it immediately regained its original posture. A stout projecting rope, with swellings upon it to increase its elasticity, surrounded the gunwale, served as a fender, and prevented it being stoved in lowering down, or when driven in contact with the vessel it might be going to relieve.

"The boat thus described had the plug out, and was filled with water until it ran over the gunwale, when a crew of four, with myself, tried it in every way, and found, from the buoyant property of the casks, it kept the boat so much above the water's edge, that it was rowed with the greatest ease, and was capable of performing any service required."

Mr J. Boyce, in 1814, obtained a medal for his life-boat and safety buoy, consisting of hollow cylinders made of canvass painted and varnished, and connected with each other. It was tried on a river, and carried a man with safety (vol. xxxii. p. 177); but surely it could not be trusted among breakers on a lee shore. In 1818, Mr Gabriel Bray obtained a silver medal for his invention of a boat filled with air boxes under the seats and along the sides. (Vol. xxxv. p. 172.)

Captain Manby's proposal for throwing ropes from ship to ship in cases of accidents, may easily be understood from the methods which he employs for saving lives in shipwrecks. Mr Thomas Cook's life-buoy is related to the same class of inventions; its object is to preserve the life of a person falling overboard in the night, by means of a floating light; and it obtained him a gold medal from the Society of Arts in 1818. (*Transactions*, xxxvi. p. 121.) He observes that a ship may often have to run half a mile before she can get about and lower a boat, so that it becomes highly desirable to afford a temporary support to the sufferer. The machine consists of two casks, with a pillar between them, carrying a composition of potfire, to be lighted by a lock when the accident happens, and to serve as a rendezvous to the man and the boat. He found that it might be lighted and let down into the water in the short time of five seconds, being always kept suspended in a proper manner between the cabin windows at the stern of the ship. Mr Miller's safety poles for skaiters, and Mr Prior's mode of preventing accidents in descending mines, are mentioned in the *Transactions of the Society of Arts* (vols. xxxii. and xxxvi.); but they do not require more particular notice on the present occasion.

A sketch of the expedients which have been recommended for the preservation of mariners, published in a work entitled *Shipwrecks and Disasters at Sea* (vol. iii. p. 459, Edinb. 1822, 8vo), contains a few further historical details relating to some of the inventions which have been described. (L. L.)

LIGATURE, in *Surgery*, is a cord, band, or string, or the binding any part of the body with a cord, band, fillet, &c. whether of leather, linen, or any other matter. See SURGERY.

LIGATURE is also used to signify a kind of bandage or fillet, tied round the neck, arm, leg, or other part of the bodies of men or beasts, to divert or drive off some disease, accident, &c.

LIGATURE, in the Italian music, signifies a tying or binding together of notes. Hence syncopes are often called *ligatures*, because they are made by the ligature of many notes. There is another sort of ligatures for breves, when there are many of these on different lines, or on different spaces, to be sung to one syllable.

LIGATURES, amongst printers, are types consisting of two letters or characters joined together; as *&*, *ff*, *fl*, *fi*. The old editions of Greek authors are extremely full of ligatures; but the ligatures of Stephens are by much the most beautiful. Some editions have been printed without any ligatures at all; and there was a design to explode them quite out of printing. Had this succeeded, the finest ancient editions would in time have grown useless; and the reading of old manuscripts would have been rendered almost impracticable to the learned themselves.

LIGHT.

SECT. I.—HISTORY OF THE SUBJECT.

The nature and properties of the agent on which vision depends have been objects of philosophical disquisition from ancient times. The earliest speculations which have reached us on this subject are those of Pythagoras, who considered vision as produced by particles continually emanating from the surfaces of bodies, and entering the pupil of the eye. The Platonists, on the other hand, conceived that vision was the consequence of the emission of something from the eye meeting with certain emanations from the surfaces of things; yet, with this very gratuitous hypothesis, the Platonists appear to have detected several properties of LIGHT, especially its propagation in right lines, and the equality of the angles of incidence and reflection when it falls on bright and polished surfaces. The effects of the concentration of the sun's rays by concave specula were certainly known to the ancients; and antiquaries have supposed, that, in this manner, the Romans kindled their *sacred fire;* and thus also it has been alleged that Archimedes destroyed the Roman fleet at the siege of Syracuse.

Aristotle regarded light but as a mere quality of matter; he has some ingenious speculations on the rainbow, and on other luminous meteors. Ptolemy the geographer wrote a treatise on optics, which has perished; but, from some fragments preserved by other authors, he appears to have had distinct ideas on the subject of atmospherical refraction.

A long interval of scientific darkness succeeded his era, until the Arabians began to cultivate the learning of the Greeks, and several of their philosophers treated of optics; but the earliest Arabian work which has reached our times, is the celebrated treatise of Alhazen. In it we find a description of the eye, and the uses of its different parts. The author details many experiments on refraction, both as exhibited in the atmosphere, and as light is modified in passing from one medium to another of different density. He also notices the magnifying power of segments of spheres of glass; a hint from which it has been supposed that the important invention of *spectacles* originated. We also owe to him the idea that single vision, with two eyes, is produced by images painted on corresponding points in each retina; and that stars may be seen by refraction, when they are actually below the horizon: remarkable speculations for the twelfth century.

The work of Alhazen was in 1270 commented on by Vitellio, a native of Poland, who added a considerable number of observations on the refractive power of air, water, and glass, which he reduced into a tabular form. He made some ingenious attempts to explain the phenomena of refraction; and he seems to have conceived the true idea of burning lenses.

Roger Bacon, the contemporary of Vitellio, was undoubtedly acquainted with the magnifying property of segments of spheres, and recommended that small segments should be preferred for such purpose; adding, *et ideo hoc instrumentum est utile senibus et habentibus oculos debiles.* This so plainly indicates the invention of spectacles, that we cannot doubt that it had then been made. We know that they became common in the thirteenth century, and are described by Spina of Pisa in 1313, although we have no absolute certainty of their first constructor.

After the revival of letters, one of the earliest cultivators of mathematics was Maurolycus of Messina, who made optics his study. He proved that the crystalline lens of the eyes of animals converges the rays of light which enter that organ, and transmits them to the retina, in or near which the foci of the lenses are situated. Hence also he inferred, that in persons who are *short sighted,* the defect is owing to the too sudden convergence of the pencil of rays before the retina; and that in those who are *long sighted,* the foci are placed behind that expansion of the optic nerve. Maurolycus, however, did not discover that the images of objects are painted on the retina.

Baptista Porta, the author of *Magia Naturalis,* a Neapolitan of rank, was much addicted to philosophic research; to him we owe the first description of the camera obscura, and its application to the delineation of objects. His work contains many observations on light, some of which are accurate; and though some are now found to be erroneous, his remarks are always ingenious. This subject also engaged the attention of Lord Bacon, who complained that the *form* and *origin* of light had been too much neglected; but his labours in other branches of philosophy diverted his powerful mind to different objects.

The true theory of the rainbow was first given by Antonio, bishop of Spalatro, although he could not satisfactorily explain the cause of the colours.

The next optical discovery of importance was the *telescope,* for which we are indebted to Zacchias Jansen, a spectacle-maker of Middleburg, in Walcheren, in 1590; and this important invention was quickly applied by Galileo to physical astronomy, with brilliant success, crowned by the discovery of the satellites of Jupiter, the structure of the Via Lactea, the phases of Venus, the ring of Saturn, the spots on the sun's disk, and a knowledge of numerous stars unknown to former observers.

The study of light was improved under the auspices of Kepler, who gave an explication of the effect of lenses on the rays, and suggested the form of the telescope now called *astronomical.* He treated of refraction, and discovered, that when light falls within glass at an angle a little above 42°, it is wholly reflected; but his theory of vision is much more important; and he showed that images of external objects are painted on the retina, and appear there inverted, a fact also ably illustrated by Scheiner. The invention of the compound microscope seems also due to Jansen, and dates from the same period.

Perspective was first scientifically treated by Pietro del Borgo, Baldassare Perussi, and Guido Ubaldi. To the second of these is due the detection of the *distance points,* to which all lines making an angle of 45° with the *ground line* are drawn; to the third, the convergence of all parallel lines inclined to the ground line, in a point in the *horizontal line;* and also that a line drawn from the eye, parallel to them, will pass through this point. These principles are the foundation of perspective, which afterwards received improvements from 'sGravesande, and were completed by Brooke Taylor. The true law of refraction is undoubtedly due to Willebrod Snell, or Snellius, professor of mathematics at Leyden. He experimentally showed that the co-secants of the angles of incidence and refraction are always in the same ratio. This discovery, we are assured, on the authority of Huygens, was appropriated by Descartes, who had consulted the papers of Snell, but gave it as his own, under a somewhat different form. The successive labours of Descartes, Kircher, Grimaldi, De la Hire, Hooke, and Huygens, gave to the study of optics a profound scientific character; and the interesting discoveries of that century were crowned by the important researches of our immortal

Newton into the optical properties of light. During the last century, our knowledge of this subject has been steadily progressive, by the labours of a multitude of philosophers, so numerous, that we can afford space for little more than to record the names of some of the most successful inquirers into the mysteries of this subtile agent. Among these, Mairan, Dufay, Mariotte, Boscovich, Euler, Mitchell, Melville, Canton, Bennet, and Lagrange, stand conspicuous; nor must we omit the important fact, illustrated by the labours of Bradley and Roemer, that the velocity of light, from whatever source derived, whether from the sun, the fixed stars, the planets or their satellites, is equal, or that its velocity before and after reflection is the same: a formidable objection to the theory of emission. During the present century, the progress of discovery in this field has been no less brilliant. Very early in it, Dr Thomas Young illustrated the principle of *the interference of the rays of light*, founded on some facts observed by Grimaldi, but first distinctly stated in Dr Young's Memoir in the Philosophical Transactions for 1803, entitled *Experiments and Calculations Relative to Physical Optics;* and his conclusions have been demonstrated beyond all doubt by the researches of Fresnel and of Sir John Herschel. The splendid talents of Laplace, of Poisson, Biot, Arago, Pouillet, Cauchy, Ampère, and Fresnel, among continental philosophers, have especially illustrated the phenomena and theory of light: and in our own country, Sir William Herschel, Young, Brewster, the younger Herschel, Airy, Whewell, have pursued these delicate investigations with singular ability and success. Above all, we must record, as among the most signal triumphs of modern science, the detection and explanation of the *polarization of light*, and the singular confirmation thereby afforded of the theory of its propagation by *undulations.*

SECT. II.—NATURE OF LIGHT.

Notwithstanding this long list of splendid discoveries, the nature of light is still in some degree enigmatical. It is admitted, that the phenomena of vision depend upon the agency of a subtile, extremely attenuated matter, set in motion by the sun and other luminous bodies. Its materiality is inferred from its deflection from its rectilinear course, in passing near various bodies; by its being arrested by certain substances, though it passes freely through others; by its reflection from polished surfaces; by its capability of condensation and dispersion, in passing through certain media; by its producing chemical changes in some compounds; and by its apparently entering into the composition of some bodies, from which it may be again extricated.

Thus far the majority of philosophers are agreed; but two opposite theories have been advanced respecting its propagation, and the mode in which it manifests itself to our senses.

Some maintain that light is a peculiar matter, which is projected in all directions from luminous bodies in a rapid succession of material particles. This theory is sustained by the illustrious name of **Newton**, and has been very generally received; but of late, certain difficulties in the explanation of the recently-discovered properties of light, especially its polarization, have tended to revive the doctrine maintained by Descartes, Huygens, and Euler, viz. that all the phenomena of light depend on the *undulations* of a highly attenuated fluid or ether, universally diffused throughout space, which, while at rest, is inappreciable by our senses, but, when acted on by luminous bodies, is thrown into a succession of waves. Luminous bodies are thus supposed to act on the universally diffused fluid somewhat in the manner that sonorous bodies do on air in the production of *sound.*

It is true, that all the known facts regarding light may be explained upon either hypothesis. It must be owned, however, that the remarkable coincidence of fact with theory, and the facility of explanation, favour the theory of undulations, while it scarcely can be said to involve any greater assumption than the doctrine of direct transmission. Both assume the existence of a subtile fluid; both admit the influence of luminous bodies; and it does not seem more difficult to conceive them acting, by causing an undulation in *the matter of light*, than by projecting it in a rapid succession of particles, the minuteness and velocity of which almost elude the grasp of our imagination.

Whichever hypothesis we adopt, the propagation of light is a process of astonishing rapidity. Astronomers have found, from observations on the eclipses of Jupiter's satellites, that planetary light requires about fourteen minutes to cross the earth's orbit; or, if we adopt the more recent and probably more accurate determination of Bradley, that the light of the sun requires about eight minutes to reach our earth; and, if we reckon the mean distance of the sun to be 94,879,956 English miles, it follows, whether we regard it as an emanation or an undulation, that light must travel with a velocity of about 200,000 miles per second.

It is difficult to form any adequate idea of such enormous velocity; but we may approximate it, by comparing this with the ascertained velocity of a cannon ball. A twenty-four pounder, with the common charge of powder, according to Robins, discharges its ball with an initial velocity equal to 1600 feet per second; yet, if such a ball were to continue this velocity undiminished, it would require about ten years to traverse a space which the light of the heavenly bodies pervades in eight minutes.

This prodigious rate, and the ease with which light can penetrate many solid bodies, have been adduced as arguments against the doctrine of the successive emanation of particles from luminous surfaces; but did not the undulatory theory afford an easier solution of certain recently-discovered properties of light, we should not regard such arguments as conclusive. Now, however, the undulatory theory has been shown to correspond so exactly with known facts, and has even enabled us to predict so exactly what experiment has since confirmed, that it has received the sanction of the greatest names in modern science.

SECT. III.—PROPERTIES OF LIGHT.

Whichever hypothesis be adopted, light must be considered as a material substance, possessed of certain properties, detected by observation and experiment.

1. Light is given out by luminous bodies in all directions, and from every point of the luminous surface. This is proved by its being equally seen from every point of observation.

2. It is divisible into homogeneous, independent portions, like air or water; the smallest portion we can separate is termed a *ray;* and several rays form a *pencil of light.*

3. Light appears to be absorbed by certain bodies, and is again given out by them spontaneously. This property is well seen in the diamond, which, after being exposed to the sun's rays, continues for a short time to shine in the dark. Various artificial *phosphori* do the same, as the Bolognian stone, calcined oyster shells, and the like.

4. All solids give out light when heated between 700° and 800° of Fahrenheit's thermometer, and are then said to be *incandescent.* All liquids that can be heated to that point are luminous, as melted metals; and, if the elasticity of their vapours be repressed, other liquids appear capable of this emission. Gases do not, however, seem to be capable of incandescence, yet the phenomena attending their sudden condensation, when they enter into chemical union,

shows that they contain light. Thus, when a mixture of oxygen and hydrogen is suddenly and strongly compressed, the gases unite to form water, and both light and heat are extricated.

5. Some bodies have the property of arresting the progress of light, and are termed *opake;* others transmit it, and are said to be *transparent.* Yet probably no substance is either perfectly opake or perfectly transparent. Thus, gold is one of the most condensed and opake bodies in nature; yet if we enclose gold leaf between two plates of glass, and examine it by transmitted light, it appears of a decidedly greenish hue; showing the transmission of some light through the metal. On the other hand, the most transparent glass, when viewed in a thick plate, and the most limpid water, when in a deep column, appear greenish.

6. When the rays of light fall obliquely on the surface of all bodies, whether transparent or opake, solid or fluid, they are more or less reflected. Smooth and shining surfaces reflect most light, but the degree also depends on the nature of the reflecting substance: the reflected rays are returned from the surface at an angle equal to the angle of incidence: if the reflecting surface be a plane, the parallel rays that fall on it are reflected parallel to each other.

When the rays are reflected from a concave surface, the reflected rays are more inclined to each other than the incident rays; and if that concave surface be the segment of a sphere, the parallel incident rays will converge to a point in the axis of the mirror half way between its surface and the centre of the sphere of which it is a segment; and this point is termed its *principal focus,* or focus of the parallel rays: if the incident rays be *converging,* they will meet the axis between the principal focus and that centre; if the incident rays be diverging, they will meet the axis in a point between the principal focus and the surface of the mirror. From the immense distance of the sun, all the incident rays may be considered as parallel; and therefore his rays will be condensed into the principal focus of such a mirror, which will in this instance also be that of greatest heat. This is the principle of burning mirrors. When the incident rays fall on a convex mirror, they are all reflected more divergingly, or are dispersed.

The properties of reflected light form the object of the science of *Catoptrics.* See Optics.

We are not, however, to imagine that all the light incident on bright surfaces is reflected. Many curious experiments were made on this subject by Bouguer. The quantity of light returned differs with the inclination of the rays to the reflecting surface. It is generally strongest at small angles of incidence; and the difference becomes excessive when the rays impinge on the surface of transparent fluids with different degrees of obliquity. Metals, from their opacity and splendour, form the best reflecting surfaces; but even pure mercury, perhaps the most perfect of reflectors, does not reflect more than three fourths of the whole incident light.

7. When the rays of light fall on transparent bodies, they are differently affected, according to the angle of incidence. When a ray passes from one transparent medium to another, in a direction perpendicular to their touching surfaces, that ray will pass through them in a straight line; but when the ray passes in a direction oblique to their touching surfaces, that ray will be bent, or will form an angle at their junction.

When the density of a medium is uniform, the rays of light traverse it in straight lines; but in a medium varying in density, like columns of liquids, or the atmosphere, in which density increases with the superincumbent pressure, the passage of the rays will form curves.

When a ray passes obliquely from a dense to a rarer medium, it is bent or deflected *from* a line perpendicular to their touching surfaces. When passing obliquely from a rare to a denser medium, they are bent *toward* the perpendicular. In such instances the light is said to be *refracted.* In the first instance, the angle of refraction is always greater than the angle of incidence; in the latter it is always less. The study of the properties of refracted light constitutes the science of *Dioptrics.* (See Optics).

8. The refractive power of different media is unequal; and when the rays of light pass from one medium to another, it may be measured by the ratio between the *sines of the angles of incidence and refraction;* and the number expressing the ratio between the first and the last is the *exponent* or *index* of the refractive power of that substance.

The refractive power of different substances appears to be nearly in the ratio of their density; but with inflammable bodies, or those containing an inflammable principle, the refractive power is in a ratio greater than their density. It was this law which led Newton to his happy conjecture that *water* and the diamond might contain an inflammable principle; speculations which have been verified by modern chemistry. The same opinion as regards the diamond was long before maintained by Boetius de Boodt. He says that unctuous and fiery bodies are easily united, but will not mix with watery substances; and because the diamond readily adheres to resins, which are of a *fiery* nature, and because, like amber, another fiery body, the diamond, when rubbed, attracts light bodies, the diamond itself must be of an inflammable or sulphureous nature: an argument which he considers as confirmed by that gem being "produced in a hot, sulphureous climate." It is obvious that the deduction of Newton differs widely in its principles from the hypothesis of De Boodt; but the latter must be regarded as a curious instance of a true conclusion derived from unsound premises.

9. If a pencil of light be admitted by a small hole in the window-shutter of a darkened room, through a triangular prism of any transparent substance, the white light will be found to undergo a remarkable change. The rays will be separated in the prism, their image will be enlarged; and, if received on a white screen, will be seen variously coloured. The colours will assume a certain determinate order of juxtaposition; and this appearance is termed the *prismatic spectrum.* This coloured spectrum will then be seen divided into colours, of which Newton enumerates seven; red, orange, yellow, green, blue, indigo, violet. These, it is evident, may be resolved into red, yellow, and blue; for the boundaries of the colours are not well defined, and the compound colours which lie between these may be considered as made up of the intermixture of contiguous rays. These rays are not in equal proportions in the spectrum. If we consider it divided into 360°, the red occupies 45°, the orange 27°, the yellow 48°, the green 60°, the blue 60°, the indigo 40°, the violet 80°; and it is worthy of remark, that this division of the scale of colour is a striking approximation to the divisions of a chord that would give the musical intervals of the octave. But as these colours are not bounded by defined lines, but graduate into each other, it is very difficult to determine their relative extent with tolerable precision. The cause of their separation is the difference of their refrangibility by the prism; the red being the least, the violet the most refrangible; that is, turned from the line of the incident pencil of light. The green ray will be found in the centre of the prismatic spectrum; and hence its index of refraction is considered as the mean refraction of the substance of which the prism consists. Newton employed in his experiments prisms of different substances; but he seems to have taken it for granted, that when the mean refraction was the same, the length of the spectrum was also equal, or that the *dispersive power* of the bodies in that case was equal. He considered that prisms and lenses of all kinds of glass,

and of all bodies, whether solid or fluid, with the same *mean refraction*, possessed also the same *dispersive power*, or formed spectra proportional to their mean refraction. Hence he was led to conclude that "the improvement of the refracting telescope was desperate." This error has, since his day, been detected; and this principle forms the basis of Dollond's admirable invention of the *achromatic telescope*, in which the error of refraction in one species of glass is ingeniously remedied by a correction derived from the different dispersive power of another kind of glass, so adapted to the first as to form with it one object-glass. The difference in dispersive power has now been ascertained in a considerable number of diaphanous bodies; and tables of this difference have been formed from the observations of many philosophers, particularly of Sir David Brewster.

The illuminating power of the different rays of the spectrum is different. Sir William Herschel found, that with a prism of flint-glass, the greatest illumination is towards the middle of the spectrum; the yellow rays affording most light, while the illuminating power, diminishing towards each end of the spectrum, is least in the violet ray. A series of experiments on this subject by Frauenhofer, a late celebrated instrument-maker of Munich, showed, that with the best made prisms, when other light is carefully excluded, the most luminous point is nearer the red than the violet end of the spectrum, in the proportion of one to four; and he states the mean refrangibility to be between the blue and indigo rays. But one of the most curious discoveries of this ingenious inquirer is, that the solar spectrum is traversed by numerous dark lines of unequal thickness, perpendicular to the length of the spectrum, and parallel to one another. These lines require a fine prism for their exhibition, a microscope for their detection, and the exclusion of light, except that of the coloured ray under examination. He counted 590 of these lines in the spectrum; the greatest number of them being towards the most refrangible end of the spectrum.

It is well known that the rays of the sun communicate heat as well as light; but the heating power of the coloured rays is very different. Herschel discovered that the red ray raises the thermometer most; and that the effect diminishes as we approach the other end of the solar spectrum. This is sufficiently striking; but in pursuing his investigations he made another singular discovery, that the point of greatest heat is fully half an inch beyond the red end of the prismatic spectrum. Delicate thermometers were placed in the different rays, and gave the following results:—

In the blue ray in	3 minutes it	= 56° F.
Green	3 ...	= 58°
Yellow	3 ...	= 62°
Middle of the red	2½ ...	= 72°
Outer confines of red	2½ ...	= 73° 5′
Half an inch beyond the red	2½ ...	= 79°

These curious experiments were confirmed by Sir Henry Englefield and Sir H. Davy. The inference from them is, that light and heat are unequally refracted.

The prisms used by these philosophers appear to have been of flint-glass; but Dr Seebeck has since found that the position of the point of greatest heat varies with the nature of the refracting prism. Seebeck found, as Herschel did, that with flint-glass the greatest heat was beyond the red; with plate-glass, in the middle of the red; with sulphuric acid in a hollow thin glass prism, in the orange; with water, in the yellow. The sun's rays would appear to be still more complex. Early in this century, Ritter of Jena found that the rays of the solar spectrum possessed different chemical powers. He found that the salts of silver became soonest black a little beyond the violet end of the spectrum, a little less so in the violet, and still less so in the blue; and Seebeck, in repeating the experiments, found that beyond the violet ray muriate of silver became reddish brown; in the blue, bluish gray; and in the yellow it retained its white colour, or at most had a yellowish tint; it became reddish in the red ray, and even when placed beyond it. These changes might have been attributed to the influence of heating or illuminating power, had not the greatest deoxidating effect been observed where the heat and illumination are the least. Dr Wollaston, who observed these facts about the same time with Ritter, considers the sunbeams as compounded of calorific and deoxidating as well as luminous rays, all with different degrees of refrangibility. But if the experiments of Morichini are confirmed, the sunbeams have also the property of magnetizing steel. About twenty-five years ago he announced this discovery; it was repeated by several persons without success, but Mrs Somervile appears to have succeeded. She covered one half of small sewing needles with paper, in Morichini's method, and exposed the naked half to the violet rays for two hours, when she found that the needle had thus acquired a north pole. The indigo ray produced nearly the same effect, but the effect was feeble in the blue and the green; while, though exposed in the orange, yellow, and red, for two successive days, no magnetism was induced. Similar effects followed when one half of the needle was enveloped in white paper, and the other half, exposed to the rays, was covered with blue or green glass, or with silk of those colours.

10. The facts already noticed respecting the bending of the rays toward the perpendicular, when they pass from a rare to a denser medium, lead to the inference that the disposition of the surfaces of the refracting medium must materially influence the direction of the rays of light which enter and pass through. Accordingly, it is found that if one or both surfaces be convex, the rays are bent toward the axis of the medium. If the medium be spherical, or a segment of a sphere, the ray, falling perpendicularly on its centre, will pass straight through; but all those that fall obliquely on the spherical surface will emerge from the medium in a direction inclined *to* the central ray (which may be considered as the *axis* of the medium), and will cut this axis in some point, which is termed the *refracted focus* of those rays. When the medium has its surfaces forming segments of spheres, it is called a *lens;* and lenses are divided into convex and concave, plano-convex and plano-concave, double convex and double concave, according to the form of their surfaces.

When a lens is nearly or really spherical, optical principles will show, that all the emergent rays will not meet in the same point; those farthest from the axis will meet first. But if the lens be a thin segment of a sphere, with one or both of its surfaces convex, this error will not be very conspicuous, and the emergent rays will meet nearly in one *focus*.

When both surfaces of a lens are *concave*, or when one is concave and the other plane, the emergent rays will be bent *from* the axis. The mathematical demonstration of these facts, their application to practical purposes, and to the explanation of natural appearances, belong to OPTICS; to which article attention is directed.

11. Some crystallized bodies have the property of dividing the rays of light which permeate them into two distinct portions, one of which passes in the ordinary direction, while the other pencil undergoes an extraordinary refraction, passing at some distance from the other. Hence, when any body is viewed through such a crystal in a certain direction, both sets of rays become apparent by giving a double image of the object. This curious property was first detected by Erasmus Bartholin, in calcareous spar brought from Iceland. But this subject was first philosophically investigated with his usual sagacity by Huygens,

who proved that the property of double refraction was not confined to calcareous spar; and it has, since his time, been shown, that all crystals, the primitive form of which is neither a cube nor a regular octahedron, possess this property. Newton attempted to explain this double refraction; but his explanation was not happy. He ascribed it to an original difference in the rays of light, by which some are refracted in the usual manner, while others undergo unusual refraction. Huygens discovered, that when the ray of light was received through the Iceland crystal in any direction but one, it was always divided into two rays of equal intensity; but he remarked with surprise, that when he received the divided rays through a second crystal of Iceland spar, the two portions into which each of them was now subdivided were no longer equally intense; that their relative brightness depended on the position of the second rhomb with regard to the first; and that there were two positions of the second, in which one of the rays vanished altogether. This Newton supposed to depend on the rays having different sides, possessed of different properties, each of which "answers to or sympathizes with that virtue or disposition of the crystal, as the poles of two magnets answer to one another."

This idea was followed up by Malus. He conceived that the molecules of this *polarized light* have all their homologous sides in the same direction; and he expressed this modification of light by the term *polarization*, as he compared the effect produced to the influence of a magnet, which directs the poles of a series of needles all to the same side—an hypothesis which Biot modified by supposing that each molecule of light had one *axis*, similarly placed in each, and all turned in one direction, in a polarized ray; while the molecules were conceived to have a free motion round such axes, by which they could assume different positions according to the attractions and repulsions they experience at the surface of each new medium they traverse. The term *polarization* is not certainly very happy, and it is to be regretted that one more appropriate and less hypothetical had not been employed.

If the rays, thus divided into two pencils by calc spar, be received by a rhomb of the same substance, while the axes of both crystals are in the same direction, no new division of the rays takes place; but if, while the first crystal remains at rest, the second be turned round, by the time it has made one eighth of a revolution the rays will be again subdivided, and four images will be produced. By continuing the motion until the crystal has described one fourth of a revolution, the subdivision will again disappear.

Malus discovered that an analogous effect was produced by *reflection*. If a pencil of rays fall on a polished surface of glass at an angle of 35° 25′, it is reflected at any angle equal to the angle of incidence. If we now place another plate of glass in such a position that the rays reflected from the first shall fall on the second also at an angle of 35° 25′, or when the plane of both reflections coincide, the rays will also be reflected from the second plate: but if the second plate be turned round one quarter of a revolution, so as to make the plane of the second reflection perpendicular to the plane of the first, the whole of the rays will now be transmitted through the second plate: when this plate has described half a revolution, the rays will be reflected as at first; and when it has made three quarters of a revolution, they will again be transmitted, *i. e.* when the planes of reflection are parallel, light is reflected, but when they are perpendicular, it is transmitted—or light in such circumstances can permeate glass in one direction, but not in another. Sir David Brewster, soon after Malus, began a vast series of experiments to determine the angles of polarization of different media, and to investigate the general law which regulates polarization by reflection from transparent bodies, which was crowned with the beautiful discovery that "*the tangent of the angle of polarization is equal to the refractive index*," or that when a ray is entirely polarized by reflection, "*the angles of incidence and refraction are complimentary*." In this sketch it would be impossible to do justice to the investigations and beautiful theoretic deductions of Fresnel, which have combined the whole into an inductive science. We must direct the reader to the article Polarization for his important labours, as well as for the profound researches of Airy, Poisson, Biot, Arago, and Cauchy.

Newton rejected the explanation of double refraction offered by Huygens, because he considered the apparent polarization of the rays of light inconsistent with motions "propagated through a fluid medium;" but this arose from his limiting his ideas of luminous vibrations, as entirely analogous to those of producing sound in air, in which they are propagated in the direction of the advance of the undulations. We owe to the late Dr Thomas Young the first idea of the vibrations being *transverse* to the direction of the luminous wave; an hypothesis which he illustrated by the propagation of the vibrations of a stretched cord put in motion at one of its ends. This happy idea has been shown to be a necessary consequence of the phenomena of the interference of polarized light, if we admit the theory of luminous waves. The subsequent investigations of Arago and of Fresnel have confirmed the speculations of the English philosopher, which have connected and elucidated those brilliant discoveries that have conferred lustre on the names of Malus, Fresnel, and Brewster. See Optics and Polarization.

SECT. IV.—COLOUR OF OBJECTS.

The discovery by Newton of the colours produced by the decomposition of the sun's rays, naturally turned the attention of that profound philosopher to the cause of colour in different objects; and he has delivered a theory of colours, of which we shall now exhibit an outline.

1. Newton regards the colour of natural objects, not as produced by any modification which light undergoes from refraction or reflection at their surfaces, but as something inherent in the rays according to their different degrees of refrangibility. The same degree of refrangibility invariably gives the same colour; and when the rays are fully separated from each other by the prism, he found it impossible to change the colour. Thus he refracted the red ray with prisms, but found its tint unaltered; he reflected it from bodies which in day light had other colours, but still it remained *red;* he transmitted it through coloured media of different tints, he passed it through the coloured rings produced by pressing together plates of glass, but he was unable to convert it into another colour. By condensation or dispersion he could render it stronger or fainter, but still it remained red. Similar experiments on the other rays were attended with similar results.

2. He found, however, that by mingling the different rays of the coloured spectrum, he could produce a sort of intermediate tint: thus the intermixture of the yellow and red rays formed an orange, and that of the yellow and blue, a green. But this effect was only distinctly produced by the intermixture of contiguous rays; if they were far removed from each other in the spectrum, no such effect was produced: thus the orange and indigo rays do not produce an intermediate green.

3. The intermixture of all the rays reproduced white light. Newton reflected a pencil of rays through a prism into a dark room, and then interposing a lens of three feet radius, about four or five feet distance from the aperture admitting the light, he collected the convergent rays upon a paper screen, and obtained an intense spot of white light. By

moving the paper he could easily find the point of perfect whiteness; and, by drawing it farther from the lens, he could reproduce the coloured spectrum in an inverted order, as the crossing rays diverged farther from each other.

If any of the coloured rays were cut off before their convergence by the lens, the image on the paper exhibited colour; and if either of them were made to predominate, that tint was rendered perceptible. Newton endeavoured to show the same with mixtures of coloured powders; and though this method presents mechanical difficulties not easily overcome, and the mixtures only afford a gray shade, yet when these were strongly illuminated by concentrated solar light, they became of a dazzling white: and all coloured objects appeared most splendid in the prismatic rays of their own colour. From these facts he considered the colour of objects to depend on the predominance of the coloured rays they reflect. Thus minium, or red lead, appears red, because it reflects principally the least refrangible rays; a violet appears of the colour so denominated, because it chiefly reflects the most refrangible rays; and what we denominate the colour of an object is merely the hue of the rays which it most copiously returns to the eye.

On the other hand, transparent bodies which have colour, when held between the eye and the light, appear so by transmitting most copiously that ray. Thus, too, we see why a body not quite transparent may sometimes appear of different colours by transmitted and reflected light. Such a body may transmit most copiously the blue rays, and reflect the green ones; as we often find in coloured liquids, and sometimes observe in the crystals of fluor spar, and other mineral substances. This fact is a confirmation of the Newtonian theory of colour; for, were the *colour* inherent in the substance itself, it ought to appear equally by either mode of viewing it.

In transparent coloured liquids the shade often varies with the thickness of the column through which the light is transmitted. Thus a clear red liquid in a conical wine glass appears below of a pale yellowish hue; higher up it seems orange, and only has its full red hue when the column is of considerable thickness. This is owing to the most refrangible rays never being able to penetrate the liquid at all. The remaining part of these rays gives the yellowish colour to the thin film at the bottom of the glass; the separation of part of the yellow rays gives an orange tint to the next film of liquid; and, when the yellow rays are wholly stopped by the thicker column, the red, or least refrangible, come undilated to the eye of the observer, and give their colour to the body of the liquid in the glass.

SECT. V.—RELATION OF LIGHT AND HEAT.

It is well known that light and heat are intimately mixed in the beams of the sun—that some bodies give out both light and heat during combustion—and that a high temperature causes the extrication of light in all bodies, the gases excepted. This intimate relation between light and heat has induced some philosophers to consider them as mere modifications of each other. Certain it is that they have many properties in common. They are capable of reflection, of refraction, of concentration, of dispersion, and of polarization—they radiate between distant objects with great celerity, they penetrate solid bodies very readily, they are absorbed by dark and rough surfaces, are generally reflected by smooth surfaces, and they are capable of subverting some chemical combinations.

These properties show very striking analogies; and the phenomena of the polarization of heat, so well illustrated by Professor Forbes of Edinburgh, have undoubtedly rendered this analogy still more apparent: yet in the present state of our knowledge, it would be rash to pronounce their absolute identity. Their total separation, at least as far as our means of detection extend, in some instances,—the very different substances which permit or retard their progress,—the different manner in which they affect our sensations,—have led some inquirers to the opposite conclusion; and though it may still be true that they are modifications of the same kind of matter, it is safest to content ourselves with pointing out those circumstances in which they differ, as well as their general agreements.

1. Light and caloric are not intercepted by the same substances. If we interpose a plate of thin transparent glass between the face and a bright blazing fire, the intensity of the light has no apparent diminution, but the calorific rays seem immediately arrested; and if we make the experiment with a thin diaphanous plate of ice, they seem absolutely intercepted. Some recent experiments of Professor Forbes, with thin plates of ice, afforded an almost microscopic effect on the galvanometer of Melloni's apparatus; but supposing there was no minute hole in the ice, the difference of the transmission of light and heat through diaphanous ice is sufficiently striking. The same takes place with all other species of terrestrial light, though, as we shall presently see, the calorific rays of the sun instantaneously pervade ice.

2. The rays of caloric are more powerfully reflected from a metallic mirror, even of an imperfect shape, than from the best glass mirror; whereas the latter very powerfully reflects light. Dark and dense solids are very readily penetrated by caloric, though they are totally impervious to light.

3. Light affects the organs of vision in a peculiar manner, without producing inconvenience to that most delicate organ, the eye; but a radiation of heat without light, as from a vessel of boiling fluid, though the rays entering the eye may be so powerful as painfully to affect the eye, does not produce any thing analogous to vision.

In the sun's rays, however, heat and light are so intimately blended, that we cannot entirely separate them. The difference in their refractive power causes a partial separation in the coloured spectrum; but both the heat and light of the sun's rays seem to pervade glass or ice with equal facility. Leslie's photometer, placed behind a sheet of diaphanous ice, is immediately affected by the direct rays of the sun, and a lens of transparent ice will concentrate them, so as to fire combustibles; as was long ago observed by Jan Metius and Descartes, and has more recently been proved by Scoresby. This difference between the calorific influence of the sun and of artificial fires has been attributed to the different initial velocity imparted to the calorific emanations in both cases. This is not improbable; but some have considered the calorific influence of the sun's rays as an effect of the condensation or fixation of light. This was the idea of the late celebrated Leslie, and is the principle of his elegant *photometer*.

SECT. VI.—MEASURES OF LIGHT.

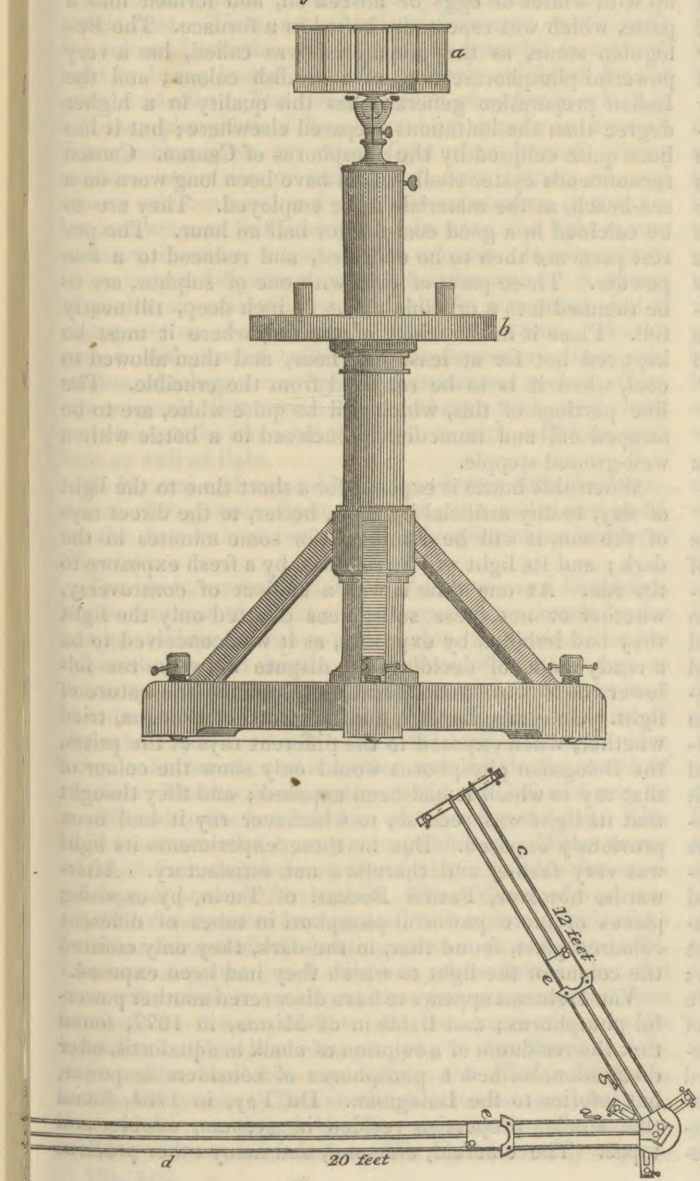
Various methods have been proposed for affording comparative measures of light. The principles of these depend either on the illumination, as ascertained by the distance at which we can distinctly perceive small objects, such as printed letters of a certain size; the comparative depths of the shadows of an opake object; or the heat excited by the luminous emanations of the bodies compared.

1. The distance at which the same eye can read a particular printed paper forms certainly a good criterion of the comparative degree of light given out by two or more luminous bodies, at the moment of comparison; but as it must greatly vary with the goodness of eye, it obviously cannot afford the basis of a general scale of illumination,

by which the same individual can compare his observations at distant periods, or render the experiments of one person comparable with those of another. Still it is a convenient method, and requires but a very simple apparatus; a tube to admit the light in an uniform manner to the paper, and a graduated sliding rule to ascertain with ease the distance of the paper from the eye.

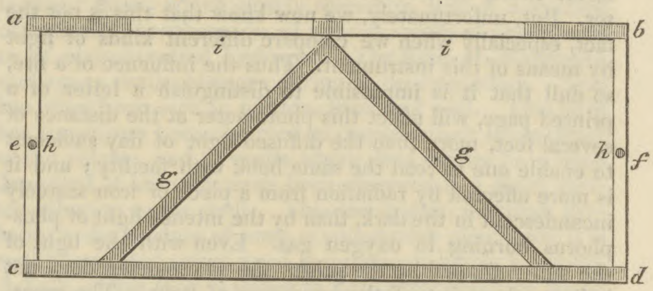
2. The comparison of shadows, which appears first to have been employed by Bouguer among several other ingenious contrivances, was the mode recommended by Count Rumford, who, in 1794, read a paper on this subject to the Royal Society of London. It is reprinted in a volume of his Philosophical Papers, published in 1802. This instrument, though well suited to the object in view, is cumbrous, and somewhat complicated. The photometric part *a* is a box eight inches wide; its back a plate of glass, covered by tissue paper, on which the shadows are projected. It is supported at a convenient height by a tripod-stand. The table consists of two narrow arms *c d*, resting on *b* at one end, and kept horizontal by feet at the other, intended to support the moveable brackets *e e*, on which are placed the lights to be compared. The arms are divided into decimals of an inch; and are here represented on a smaller scale than the rest of the instrument.

Rumford's Photometer.



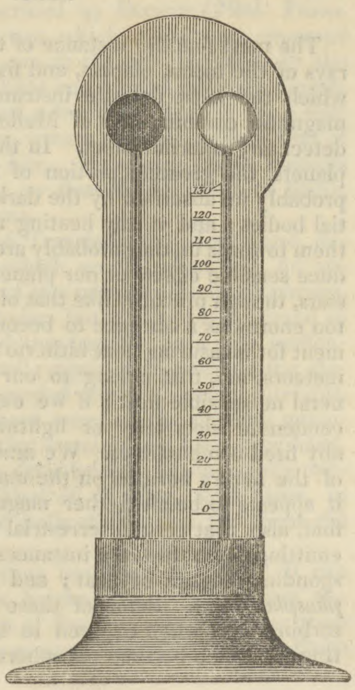
Similar results may be obtained by the following contrivance, proposed, we believe, by Dr W. Ritchie. It consists of a rectangular box of brass, *a*, *b*, *c*, *d*, three inches long, and 2·2 inches wide. In its centre are two plane glass mirrors, *g g*, two inches square, cut from the same plate, and placed accurately at angles of 45° to the base of the box, as in the diagram. Each end *e f* of the box is open, and has, at equal distances from the mirrors, two cylindrical wires of brass, *h*, *h*, 0·2 inch in diameter, fixed vertically in the centre of the box. The top of the box consists of two thin plates of glass, *i i*, on which is pasted tissue paper. The inside of the box and the wires are blackened. When the two lights to be compared are placed before the ends of the box, and in its axis, the shadows of the wires will be reflected from the inclined mirrors on the tissue paper. The adjustments of the lights to the machine may be conveniently made by sliding brackets, placed on a long and steady table. If one of the lights be fixed, the other is to be moved backwards or forwards, in the line of the axis of the machine, until both shadows of the wires shall be of equal intensity. Thus, as the intensity of the light, in such cases, is inversely as the square of the distance of the luminous body, the difference between the position of each light, ascertained either by a graduated fillet on the table, or by a common Gunter's scale, will afford a numerical value of the comparative intensity of each light. The method appears sufficiently accurate for such experiments, but, like the former mode, is not susceptible of a fixed scale, unless we could find some uniform unvarying light to be considered as a standard.

Ritchie's Photometer.



3. The calorific influence of luminous matter was proposed as the measure of the light by Lambert, and was adopted by Sir John Leslie as the principle on which he constructed his photometer. It is the author's differential thermometer, with one of its balls made of black enamel, while the other is of clear glass. An instrument so prepared, when exposed to a heating cause, has its balls unequally heated. To prevent the influence of currents of air, the whole is covered with an air-tight case of transparent glass. The black ball absorbs the calorific rays which impinge on it, the air within it expands, and raises

Leslie's Photometer.



the coloured liquor in the opposite stem of the instrument, to which a scale of equal parts being attached, each equivalent to $\frac{1}{10}$th of a degree of the centigrade thermometer, affords a numerical result; and if we were sure that the intensity of the light is always in proportion to the calorific effect, the instrument would be a perfect photometer. But, unfortunately, we now know that this is not the fact, especially when we compare different kinds of light by means of this instrument. Thus the influence of a fire, so dull that it is impossible to distinguish a letter of a printed page, will affect this photometer at the distance of several feet, more than the diffused light of day sufficient to enable one to read the same book with facility; and it is more affected by radiation from a piece of iron scarcely incandescent in the dark, than by the intense light of phosphorus burning in oxygen gas. Even with the light of the sun refracted by the prism, the photometer does not indicate the point of the maximum of light. The greatest illumination is in the yellow rays; but this photometer rises highest when in or just beyond the confines of the red.

But if we employ the instrument for the purpose chiefly in the view of its ingenious inventor, the measure of the intensity of solar light, this beautiful instrument appears to us the most elegant and useful photometer hitherto proposed. Its delicacy is such, that when freely exposed, in our climate, to the light of the sky, without being acted on by the direct solar rays, it generally ranges in summer from 30° to 40°, and in winter from 10° to 15°. Exposed freely to the sun-beams at noon in summer, it usually mounts to between 80° and 90°; and in the depth of winter is generally about 25°. In the glowing language of its inventor, "the photometer exhibits distinctly the progress of illumination from the morning's dawn to the full vigour of noon, till evening spreads her sober mantle. It marks the growth of light, from the winter solstice to the height of summer, and its subsequent decay through the dusky shades of autumn; and it enables us to compare, with numerical accuracy, the brightness of distant countries—the brilliant sky of Italy, for instance, with the murky air of Holland."

SECT. VII.—EVOLUTION OF LIGHT WITHOUT APPRECIABLE HEAT.

The most familiar instance of this phenomenon is in the rays of the moon, planets, and fixed stars, in the beams of which the most delicate instruments, even the thermo-magnetic combinations of Melloni, have been unable to detect any calorific effect. In the beams of the moon and planets, the greatest portion of the incident light would probably be absorbed by the dark nucleus of those celestial bodies; and if any heating rays were emanated from them towards us, they probably are far too attenuated to produce sensible effects at our planet. The light of the fixed stars, though probably like that of the sun, radiates through too enormous a distance to become sensible to any instrument for measuring heat hitherto contrived. The luminous meteors, too, that belong to our atmosphere, have in general no sensible heat; if we except meteoric stones and condensed electricity or lightning, which has occasionally fired combustibles. We must not confound the effect of the aurora borealis on the magnetic needle with heat; it appears to be altogether magnetic, not calorific. We find, also, that certain terrestrial bodies have the power of emitting light, in some instances largely, without a corresponding degree of heat; and such are usually termed *phosphorescent.* Some of these have the property of absorbing light when exposed to it, and again visibly emitting it. Some become phosphorescent when slightly heated; others give out light during their spontaneous decomposition. Phosphorescence has been examined by Bartholini, Fabricius ab Aquapendente, Bayle, Algarotti, Reaumur, Father Beccari, Father Bourges, Abbé Haller, Seroi, and Canton.

1. Many bodies, when exposed to light, particularly that of the sun, absorb it, and emit it immediately on being removed into a dark place. When a diamond of some size is thus exposed, it has been observed to give out flashes of light in the dark for a short period, and it recovers this property on a fresh exposure. Several other precious stones, some calcareous minerals, almost all animal and vegetable substances, when very dry, or after solution in nitrous acid, and even snow, are stated by Beccari to possess the same property in a greater or less degree. Several artificial compounds, when carefully calcined, have the same effect. This is particularly the case with the *Bolognian stone*, and with Canton's phosphorus. The former is a calcined sulphate of baryta, found at the foot of Monte Paterno, near Bologna. Its properties were first discovered by Vincenzo Cascariolo, a shoemaker of that city, who, from its weight, mistaking it for a metal, attempted its reduction. The inventor kept the process secret, but it seems to have at length transpired: according to Kircher, the stone was reduced to a fine powder, beaten up with whites of eggs or linseed oil, and formed into a paste, which was repeatedly baked in a furnace. The Bolognian stone, as the preparation was called, has a very powerful phosphorescence, of a reddish colour; and the Italian preparation generally has this quality in a higher degree than the imitations prepared elsewhere; but it has been quite eclipsed by the phosphorus of Canton. Canton recommends oyster shells which have been long worn on a sea-beach, as the materials to be employed. They are to be calcined in a good coal-fire for half an hour. The purest parts are then to be collected, and reduced to a fine powder. Three parts of this, with one of sulphur, are to be rammed into a crucible about $1\frac{1}{2}$ inch deep, till nearly full. Place it in the midst of the fire, where it must be kept red hot for at least one hour, and then allowed to cool, when it is to be removed from the crucible. The fine portions of this, which will be quite white, are to be scraped off, and immediately enclosed in a bottle with a well-ground stopple.

When this bottle is exposed for a short time to the light of day, to any artificial light, or, better, to the direct rays of the sun, it will be luminous for some minutes in the dark; and its light will be renewed by a fresh exposure to the sun. At one time it was a subject of controversy, whether or not these substances emitted only the light they had imbibed by exposure, as it was conceived to be a ready mode of deciding the dispute between the followers of Newton and Descartes respecting the nature of light. Galeazzo, Zanotti, and Algarotti of Bologna, tried whether, when exposed to the different rays of the prism, the Bolognian phosphorus would only show the colour of that ray to which it had been exposed; and they thought that its light was reddish, to whichever ray it had been previously exposed. But in these experiments its light was very feeble, and therefore not satisfactory. Afterwards, however, Father Beccari of Turin, by exposing pieces of more powerful phosphori in tubes of different coloured glass, found that, in the dark, they only emitted the colour of the light to which they had been exposed.

Van Helmont appears to have discovered another powerful phosphorus; and Baldwin of Misnia, in 1677, found that the residuum of a solution of chalk in aquafortis, after distillation, formed a phosphorus of considerable power, but inferior to the Bolognian. Du Fay, in 1734, found that similar properties resided in gypsum, marble, and topaz. The emerald, diamond, and many other precious stones, he found to have the same property, without calcination, and by mere exposure to light. From the experiments of Margraaf, all the earthy sulphates have this property when calcined; but he thought that neither metals, metallic ores, nor agates, possess it. The analysis of topaz shows that it contains fluoric acid; and we may now generalize the observation, and state, that all substances capable of becoming phosphorescent by calcination contain some fixed acid, and probably all minerals containing such acids are capable of becoming, in like manner, phosphorescent.

The experiments of Canton are the most complete on this subject (*Phil. Trans.* lviii.). When his phosphorus was, for a short time, exposed to the light of a candle, the moon, or the diffused light of day, it shone for a considerable time in the dark. When exposed to the direct rays of the sun, it gave out light for two hours, at the common temperature of the air. When it had ceased to shine in the dark, the application of heat renewed its luminousness for a short time. If the glass containing the phosphorus be placed in boiling water, its luminousness will be stronger than in the cold, but will last a shorter time. When it has ceased to give light in hot water, it will again give out light on being placed on a hot iron between 400° and 700° Fahrenheit.

2. Some natural bodies become phosphorescent by a gentle heat. Thus, some kinds of fluor spar, particularly the coloured varieties, give out a pure greenish or a bluish light by being heated; and this is finely exhibited by the green varieties. The mineral called *phosphorite*, which is a fibrous phosphate of lime, found principally in Spanish Estremadura, gives out much light when heated. Some marbles, some ores of metals, coal, wax, butter, oil, and several other mineral and vegetable substances, so treated, become more or less luminous. In some the light is momentary, in others it lasts several minutes. It soon attains its maximum brightness, and then fades away. A stream of cooler air extinguishes the light for a moment, but it re-appears on the ceasing of the cool current. Analogous to this class of bodies in some degree are those substances which give out light on percussion; such as siliceous minerals, either with one another or with steel, hard porcelain, or the like; but they also, in such collisions, emit heat as well as light.

3. Mineral and vegetable bodies, during their decomposition, often give out light. Fish, mutton, and rotten wood, are the best known instances of phosphorescent bodies of this class.

The luminousness of fish is well known; and Dr Hulme has shown that the light of herrings and mackerels begins to appear while the fish is still eatable, and soon arrives at its maximum, but begins to decrease when they pass to putridity. To produce this change, the fish should be kept in a dark and cool place. It is not confined to the skin of the animal, for if cut into pieces, the surface of each piece becomes luminous; and it is often seen within the mouth of the fish. The luminous matter easily rubs off, and may be transferred to the hands of him who touches the fish. This light is not attended by any perceptible heat. When scraped off, it forms a gelatinous liquid, that will shine for several days, if preserved in a phial. The addition of fresh water, lime water, water impregnated with carbonic acid, of vegetable acids and alkalies, extinguishes it, as do neutral salts, infusions of pepper, and camphor, when strong; yet the same substances, in a weak solution, seem to promote it, and even render it more durable; but sea-water increases its splendour. This luminous property is also found in lobsters and in shell-fish, especially in the *Pholas Dactylus*, and its congeners. This shell-fish is luminous when quite fresh, and is mentioned by Pliny as rendering the mouths of those who eat it luminous. The light is readily imparted to milk and sea-water, but it is extinguished by spirit, wine, or vinegar. Sea-water, thus rendered luminous, increases in brightness by a gentle heat; but when heated to 133° Fahrenheit, it is suddenly extinguished, and cannot again become luminous. This luminous matter, when narrowly examined, sometimes appears to give out a sort of lambent flame, which closely resembles that of a solution of common phosphorus in oil; and it smells of phosphorus or of phosphuretted hydrogen. The flesh of *Mammalia* undergoes similar changes during its decomposition. This has often been seen in mutton, beef, and veal. This light has sometimes been observed on corpses, much to the terror of the vulgar; and in vaults where dead bodies have been deposited, it has sometimes been observed in a glairy matter adhering to the vault. This last matter, however, probably is the produce of some cryptogamian plant; and it is well known that rotten wood is sometimes highly luminous. A light of this kind is stated to have been observed round the body of a woman at Milan, but it flitted from the bed on the approach of the reporter. This appearance has been more frequently seen around graves, and has obtained in Scotland the name of *elf-candles.*

The light from corrupting animal and vegetable matter requires oxygen in some form for its continuance. It is soon extinguished in the exhausted receiver of the air-pump, as Mr Boyle long ago observed; but it would seem that the small quantity of air which is contained in water is sufficient to sustain its luminousness. No perceptible heat is extricated in any of these kinds of phosphorescence.

Analogous to the light from decaying organized bodies, is the curious meteor termed *ignis fatuus*, or *will-o'-the-wisp.* Its ordinary appearance is like the faint flame of a taper; sometimes it resembles the light of a torch, or a faggot; but it usually recedes as it is approached, and can rarely be observed near at hand. The colour of the light is usually pale bluish, and seems brightest when most distant. It is most frequent in marshy grounds, in churchyards, or where a considerable mass of animal and vegetable putrefaction is going on. Dr Derham once observed an ignis fatuus playing round the head of a dead thistle; and, by cautiously approaching, he got within two or three yards of it, when a slight movement of the air made it flit; and when he pursued it, he was unable to overtake it.

A remarkable appearance of ignis fatuus was, about a century and a half ago, common in the vicinity of Bologna, which has been well described by Beccari (*Phil. Trans.* vii.). He estimated that two, which at that time appeared almost every dark night, one to the east, the other to the north, of the city, gave light equal to an ordinary faggot. One of them accompanied a friend of Beccari for a mile along the road to Bologna, giving as much light as that of the torch carried before him. Sometimes these meteors divided into several parts, or floated like waves of flame, dropping small scintillations.

Dr Shaw, the author of Travels in the Holy Land, describes a remarkable one which accompanied him, for upwards of an hour, in one of the valleys of Mount Ephraim. Its shape was at first globular, but it afterwards spread so as to involve the party of the traveller in a pale inoffensive blaze, then disappeared; again it re-assumed the globular form, and again expanded itself, at certain intervals, over more than two or three acres of the adjacent mountains. The atmosphere that evening had been very hazy, and the dew, as it fell on their bridles, felt unusually unctuous and clammy; a kind of weather, says Shaw, in which sailors observe the balls of fire that flit about the masts and yards of ships.

The cause of ignis fatuus has been disputed. It can scarcely be accounted for by the phosphorescence of the glow-worm, or any species of fire-fly. It differs also from electric flame, but has the greatest resemblance to the flame of phosphuretted hydrogen; a gas which spontaneously inflames, on coming into contact with air, and which is given out during the corruption of organic matter. This gas is absorbable by water and by fatty oils, to which last it imparts its phosphorescent qualities; and perhaps the luminousness of fish may depend on the union of this substance with oily or mucous matter. There is some difficulty in accounting for the appearance so constant and considerable as that described near Bologna. The ground on which the largest meteor appeared is a hard clay, very retentive of water; while in the hilly district, where the Bolognian ignis fatuus was smaller, the soil was a loose sand. Beccari however states, that they chiefly frequented the banks of streams. All accounts confirm the absence of sensible heat from these meteors.

SECT. VIII.—LIGHT EMANATING FROM LIVING ANIMALS.

A luminous appearance somewhat similar to that given out by decaying organic matter is occasionally observed to play round some classes of living animals; and regularly emanates from the bodies of others, at particular seasons; or as a constant concomitant of motion, by another class.

Of the first kind, probably, is that light sometimes observed playing around the ears and manes of horses, which, though by some attributed to electricity, is probably an emanation from the animal itself; and may perhaps consist of a phosphuretted gas, disengaged by some unknown process of the animal economy. A lambent flame, of a similar nature, has in a few instances been remarked around the heads of children; a circumstance which is happily seized by Virgil in his fine description of the glory that appeared on the temples of the young Ascanius.

> Ecce levis summo de vertice visus Iuli
> Fundere lumen apex, tractuque innoxia molli
> Lambere flamma comas, et circa tempora pasci.
> Æn. ii. 683.

Living vegetables, in like manner, also occasionally give out light. This has been particularly noticed in the marigold, the orange, the Indian pink or lilium bulbosum, aconitum napellus, tropœolum majus, &c. But there are animals in whom luminousness forms a necessary part of their economy.

The most familiar instance of this is the common glow-worm, *Lympyris noctiluca*, and its congeners. The male of this species is a *coleopterous* insect, and sports in the air; while the female is *apterous*, doomed for ever to crawl among herbaceous plants, or to nestle on the leaves of shrubs: but when the shades of evening are drawn around, during the summer months, a spot of lucid yellow light, generally tinted with a shade of green, emanates from the extreme rings of her abdomen, and sprinkles the hedges, in some parts of our island, and the warmer parts of Europe, with brilliant stars. The final object of this light is probably to attract the notice of the male insect, who otherwise could with difficulty distinguish his wingless mate. The male of the English glow-worm is generally believed to be destitute of the apparatus for light; though Mr Waller (*Phil. Trans.* for 1684) asserts, that the male of one species of English glow-worm has the luminous appendage. The winged species of glow-worm are common in Italy, Spain, the south of France, and still more so in equinoctial America, in which the flickering light of the numerous fireflies affords a pleasing and interesting spectacle. This light is found to belong to both sexes, though it is most striking in the females.

But the luminous property of the *Fulgora Lanternaria* of South America surpasses that of all animals, in the splendour of its light. It is a large insect, of the order *Hemiptera*, three and a half inches long. It has a sort of thick proboscis, about one inch in length, which is the luminous organ. The light emitted by this species is so splendid that two or three of them will illuminate a chamber.

In all these animals the light has so much the appearance of phosphorus dissolved in oil, that probably it may be a secretion of an analogous nature.

Many animals inhabiting the sea are highly luminous; and it is almost established that the luminousness so often exhibited by the ocean depends entirely upon myriads of minute phosphorescent animals.

This appearance is not constant, but is very frequent in most latitudes, and generally, whenever the night is dark, may be seen exceedingly brilliant around our own coasts. When the water is still, it is seen as numerous bright points of a bluish white phosphorescent light of considerable intensity; but when the water is agitated, as by the waves, the motion of a ship, or the dashing of oars, the light appears often in flashes so intense as to show the hours on a watch, or to render legible the pages of a large printed book. The number of the luminous points varies greatly at different times and in different places; and often in the course of a short sail this fluctuation is very conspicuous. We have observed the coruscations, during a gentle breeze, like a line of fire several hundred yards in length from the bows, or in the wake of the vessel. This appearance is found in every sea, but with some difference in intensity and colour, as it seems to proceed from various genera of animals.

The luminousness of the sea was long ascribed to electricity; but about the beginning of this century it was proved, in many instances, to depend on the presence of animalcules in the ocean, particularly of a minute species of medusa, which abounds in our seas, and seems to be the same as *M. Hemisphœrica* of Müller. Several years before, Sir Joseph Bankes discovered other two animals which rendered the sea luminous, viz. a sort of shrimp, *Cancer Fulgens*, and a large medusa, *M. Pellucens*, both of which abound on the coasts of Brazil.

About twenty-two years ago, the writer of this article made many observations on this subject, both on the coasts of Britain and in the Bay of Biscay. When the water was very luminous in that sea, on several evenings he drew water and carried it for examination into the cabin. Of course it ceased to appear luminous when viewed by candle light, but he could distinguish, floating in a glass of sea-water, a number of pellucid animalcules, which, when magnified by the globular form of the containing vessel, evidently belonged to several species of *Medusaria*, among which he could observe the genera *Noctiluca* of Lamarck, a *Cayanea*, and a *Beroe*. The general size of these animals was from one twentieth to one thirtieth of an inch in diameter. That the luminousness of the sea was derived from these minute animals, appears to be proved by the following simple experiments. Portions of this sea-water were put into separate beer glasses, and the number of animalcules in each was carefully ascertained: they were carried successively to the deck, and when the water was dashed on it, the number of lucid points was ascertained. In most instances the number of these points coincided with the number of animals previously observed in the glass; in no instance were the lucid points *more;* though occasionally they were not so numerous, probably owing to some of them adhering to the glass, or having escaped the shock that stimulated their light-making organs. The same animals he has often observed, even more numerous, in the luminous sea-water of the British coasts; and has obtained similar results by a repetition of the experiments. The luminous points often adhere to the fingers; and on introducing such a luminous speck into a glass of non-luminous sea-water, careful inspection will show a medusary animal floating in the water. The sea-water, on such occasions, if left at rest in glass vessels on deck, or even if suspended in gimbals, would occasionally exhibit luminous points; and the author conceives that the light either attends the voluntary movements of those minute creatures, or is emitted at their will. When sulphuric or other strong acid is poured into luminous water, it will produce a considerable flash of light, either by the effort of the animals to escape, or the unexpected stimulus it produces. In some climates the sea exhibits a fiery-red hue. This has often been observed in the Chinese seas, and in some parts of the Indian Ocean. It is produced, according to the best authorities, by myriads of minute animals that emit a reddish light. Captain Horsburgh and Mr Langstaff have described other kinds of light occasionally observed in the Indian Ocean. The latter mentions, that during a passage from China to New Holland, the sea at night had a faint milky appearance, as if snow had just fallen on the water. The sailors thought it was produced by a coral shoal, but seventy fathoms of line did not find bottom; and when the water drawn up was examined, it was observed to swarm with minute globular bodies, about the size of a pin's head, linked together, and of a milky hue, probably some minute species of medusa. It is well known that the larger fish are sometimes luminous. This has been remarked in the bonito and the shark; but whether they are naturally luminous, or only in consequence of the adhesion of luminous animalcules to them, is not determined.

Some have ascribed the luminousness of the sea to electricity, others to putrescent particles in the water. The former opinion is not probable, from the appearances observed; the latter is supported by the luminous matter of dead fish being diffusible through water, and imparting to it luminous qualities; but the known phosphorescence of many small sea animals, and the coincidence of the number of scintillations, in the experiments above detailed, with that of the animals observed, incline us to believe that the luminous appearance of the ocean depends on the presence of minute animals.

SECT. IX.—CHEMICAL EFFECTS OF LIGHT.

Light appears to be possessed of chemical properties and energies distinct from those of heat, which may be considered as further proofs of its materiality.

It is capable of decomposing various metallic salts. Thus, if a colourless solution of nitrate of silver be exposed to light, it gradually blackens; a powder is deposited which has the same colour, and the salt is found to have lost a portion of its oxygen. This change is more rapidly effected by the direct rays of the sun than by the diffused light of day. The neutral solutions of gold, also, when exposed to light, in contact with charcoal, with vegetable or animal matter, as cotton and silk, are decomposed. This is the principle of the beautiful process invented by Mrs Fulhame, for ornamenting muslin and silk stuffs with flowers and sprigs of gold. The salt of gold parts with its acid and its oxygen to the vegetable or animal matter through the agency of light. The dry salt formed by dissolving gold in nitro-muriatic acid is also slowly decomposed by light under similar circumstances.

Scheele examined the effects of light on metallic solutions, and discovered that the chemical effects of the different coloured rays of the prismatic spectrum were different. By enclosing solutions of silver in glasses of different colours, he found, that in red glass there was very little effect produced, whilst in violet-coloured glass the blackening was speedily produced. These interesting facts were confirmed by Senebier and by Thomas Wedgwood. The latter showed, that in the full sunshine, the blackening of muriate of silver was produced in two minutes, and in the shade that several hours were required to produce this effect. The sunbeams transmitted through red glass have very little blackening effect; yellow and green glass are somewhat more effectual; but blue and violet glass produce the most decisive effects. The discovery of Herschel, respecting the different refrangibility of light and heat, induced Ritter and Wollaston to try the effect upon the salts of silver beyond the violet ray; and they found that the blackening was most decided beyond the visible boundary of the spectrum at the violet end. In some experiments of Senebier, muriate of silver was darkened by the violet ray in 15″, by the blue in 29″, by the green in 37″, by the yellow in 5′ 30″, by the orange in 12′, and by the red in 20′. These effects are wholly due to light; for no effect is produced in the hottest point just beyond the red rays.

Berthollet proved, that during the action of light on many metallic oxides, as those of gold, silver, lead, and mercury, a portion of their oxygen was extricated; and this is supposed to be the change produced in the blackening of the salts of silver,—a partial reduction of the metal. Sir H. Davy found that tritoxide of lead, when moistened, and exposed to the red rays, became red, that is, it lost oxygen, and became a deutoxide. Oxide of mercury, obtained by mixing potash and calomel, was not changed by the most refrangible rays, but became red in the least refrangible rays, which must have resulted from the *absorption* of oxygen. The violet rays produced on the moistened red oxide of mercury the same effect as a stream of hydrogen gas, that is, a deoxidation. Wollaston found that these rays produced an *oxidizing* effect on one vegetable substance, resin of guaiacum. This resin becomes green by absorbing oxygen; and he found that it underwent this change in the violet rays, but again obtained its yellow hue on being exposed to the red rays.

Some of the acids suffer decomposition by light; thus, if we expose colourless nitric acid to the sun's rays, in a flask provided with a bent tube, and terminating in a pneumatic apparatus, the acid becomes coloured, from the formation of nitrous gas, and oxygen may be collected in the trough in the usual way, as Berthollet ascertained. Light also decomposes some vegetable acids, such as the hydrocyanic; and to preserve such compounds pure, it is necessary carefully to exclude light.

Light also in some cases favours chemical combination. If chlorine which has been collected over water, and therefore contains water, be exposed to light, the water is slowly decomposed; its hydrogen enters into combination with the chlorine to form hydro-chloric or muriatic acid, and its oxygen is liberated. The influence of light is still more striking on chlorine and on hydrogen. If we mix equal proportions of these gases, and the access of light be carefully excluded, no action takes place, or their union is very slowly produced; but if we expose them to the diffused light of day, combination will take place in a quarter of an hour. If exposed to the direct beams of the sun, the union is instantaneous, and with a violent explosion. Davy found that when such a mixture was exposed to the red rays only, the gases united without explosion, yet more rapidly than when exposed to the violet rays; but that the conversion of a solution of chlorine into muriatic acid took place most readily at the most refrangible end of the solar spectrum.

SECT. X.—EFFECTS OF LIGHT ON PLANTS.

The change produced on vegetable colouring matter by light is familiar in the process of bleaching by exposure to the sun. But the influence of light on living vegetables is much more remarkable.

If a plant grow in total darkness, its natural green hue is not acquired; but it will be white, though in other respects vigorous. This is familiar in the *etiolation* or blanching of certain garden-stuffs, as celery, sea-kale, endive, &c. The late Professor Robison, many years ago, remarked that plants growing in darkness were not only white, but that they did not attain the natural form of their leaves, nor their natural odour. In descending into a coal mine, he accidentally met with a plant growing luxuriantly, the form and qualities of which were entirely new to him. The sod on which it grew was removed, potted, and carefully attended to in his garden. The etiolated plant languished and died; but the roots speedily threw out vigorous shoots, which, from the form of the leaves, and peculiar odour, he readily recognised as common *tansy.* He repeated similar experiments upon plants of lovage, carvi, and mint, with analogous results.

The green colour of vegetables, and even the form of their leaves, are materially influenced by light.

Some experiments of Senebier would lead to the conclusion that it is the violet end of the spectrum which has the greatest influence in counteracting the effects of *etiolation.* This production of the dark colour of plants would appear to depend upon the decomposition of carbonic acid by the living vegetable, when acted on by light, and the fixation of its carbon. That light is necessary to this process, is proved by the experiments of Priestley, Senebier, Ingenhouz, De Saussure, Davy, and many vegetable physiologists. Growing plants in sunshine give out oxygen by the decomposition of carbonic acid; but in darkness carbonic acid is evolved; and Ellis has demonstrated, in his interesting essays, that oxygen, under such circumstances, always disappears from the air in which vegetation is going on. Light, then, acts an important part in the vegetable economy, by fixing the most dense and abundant of the three general elements of vegetable matter. The influence of light in maturing fruits is well known. The fruits which when ripe are saccharine, are previously *acid;* that is, their hydrogen and carbon are combined with an excess of oxygen. Light, by favouring the evolution of oxygen, and the fixation of carbon, converts the vegetable acid into sugar, and thus provides a suitable food for the embryon in the seed. On the other hand, the influence of light is not less conspicuous in another class of vegetables. In an early stage of the germination of seeds yielding farina when ripe, the tender rudiment of the seed is enveloped in a slightly saccharine juice, as may be seen in young wheat and maize. Now, what is wanted to convert them into farina is the evolution of oxygen, and the fixation of a larger quantity of carbon. These two indications are fulfilled by the influence of light on the growing vegetables; and thus we can explain why the sun's influence is so essential in the one case to the formation of sugar from an acid; and in the other, of farina from a saccharine juice. The same principles will explain why a farinaceous seed, when planted in the ground, becomes again saccharine. Light is now wanting; oxygen is absorbed, and partly aids in the evolution of the redundant carbon, partly is added to the two other general elements. This view affords an instance of the important agency of light in vegetation, and a beautiful example of the simplicity of the means employed to produce diversified effects in the works of creation.

SECT. XI.—EFFECTS OF LIGHT ON ANIMALS.

The facts noticed in the last section show the powerful influence of light on vegetable forms. But its effects on the exterior of animals, though less striking, are not unimportant.

1. The influence of the sun's rays in deepening the colour, or in giving a brown tint to the skin, seems to be more due to the light than to the heat of the sunbeams; for the parts of the skin covered by the clothes, though kept thus hotter than the parts exposed, do not undergo this change. The pale visage and enfeebled vitality of those who live much in obscure apartments, in prisons, and in mines, are well known; and though probably the most violent symptoms that characterize the *anhæmia* of miners, in which the skin assumes a yellowish, waxy hue, and the lips become bloodless, be chiefly due to breathing a vitiated atmosphere, yet some influence is certainly attributable to want of light. The anhæmia of persons long confined in dungeons has often been remarked, and was lately described as strikingly exemplified in the person of Caspar Hausser, the young man whose mysterious birth, confinement, and assassination, have hitherto baffled conjecture.

In climates where the heat renders a state almost approaching to nudity desirable, all travellers agree that the development of the human frame is early, and the form has fewer deviations from the symmetry natural to the race than among northern nations. Deformity is said to be comparatively rare in hot climates, where the surface is much exposed; and this has been attributed by Dr Edwards in some measure to the influence of light. Perhaps, after making due allowance for the less chance of rearing sickly or deformed children among barbarous nations, and for the prevalence of infanticide among them in such cases, there is considerable justice in his remarks on this subject; without which it would be difficult to account for the fine muscular and rounded forms so often observed among nations agreeing in nothing except in the prevalence of a very free exposure of their persons to the full influence of light; as among the Mexicans and Peruvians, the Chaymas and Muyscas of South America, the Caribbs of the Antilles, the inhabitants of the numerous groups of the South Seas, or the free inhabitants of Africa. Probably, too, a part of the effects attributed to country air, in restoring to health the sickly child of the city artizan, is due to *insolation,* or the exposure to light, which appears to have the property of invigorating the vital functions, and of elevating the spirits of those who have suffered a long deprivation of its cheering influence.

2. The effect of light on the lower animals is more marked, and is strikingly illustrated in the curious experiments of Dr W. F. Edwards upon the spawn of frogs. He enclosed portions of the spawn of the frog in different vessels permeable to water, some of which were perfectly opake, while others freely admitted light; the temperature was the same, yet the eggs exposed to light came to maturity; but those deprived of light were not hatched.

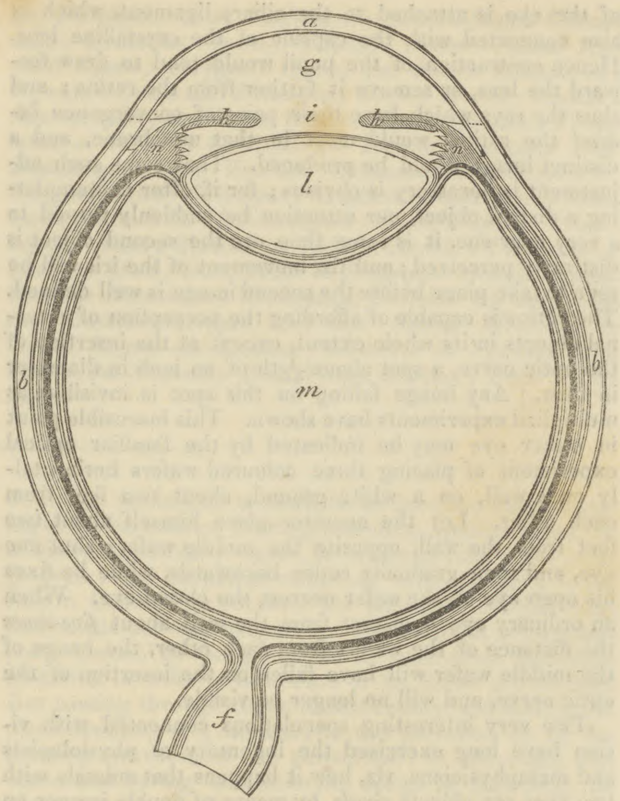
He even found that the development of the perfect form of such animals depended on light. By enclosing tadpoles of both frogs and toads in different boxes, some of which freely admitted light, while others totally excluded it, and placing them in running water, he found that the tadpoles exposed to light underwent the change to the perfect form of the animal, as usual; while the tadpoles excluded from the light, though they seemed perfectly vigorous, did not undergo the transformation, even though they had increased to double or triple their primitive weight. He also conjectures that the Anguine Syren, *Proteus anguinus,* may only be the larva of some reptile retained in its imperfect form by the profound obscurity of the subterranean lakes of Carniola, in which it is found. In this conjecture, however, he is mistaken; for that singular animal has been kept alive without change a considerable time, under circumstances favourable to its transformation, if really an imperfect species, by various naturalists; particularly, as we have been informed, by the Austrian archduke John; and also by Mr Melly, a zealous naturalist now resident in Liverpool.

The facts, however, already detailed, show that the influence of light on the animal economy is by no means inconsiderable. But the most interesting property of light, in relation to animals, is its effect in producing vision.

3. The rays of light emanating from bodies, or reflected from their surfaces, are destined to impress the sensorium through the EYE; an admirable and complex optical apparatus, in which the rays, after passing through the transparent *cornea, a,* sustain various refractions, until they reach the sentient expansion of the optic nerve, *f,* called *retina.* The cornea constitutes the front of the eyeball, the rest of its surface is formed of a dense white tunic, called the *sclerotic coat, bb,* which joins the cornea by its edges, forming with the latter an almost globular body, which contains the more delicate structures of the eye. Just within the cornea is observed a coloured ring, apparently formed of diverging fibres, termed the *iris, hh.* This ring is perforated by the *pupil,* a circular aperture in its centre, which is capable of contraction and expansion, by the action of the fibres of the iris, according to the increase or diminution of the light. This movement of the pupil is not under the will of the animal, but is regulated by the stimulus of light, so as to exclude a quantity that would be hurtful to the organ. The iris is attached to the outer coat of the eye, the sclerotic, by the *ciliary processes, nn.* Within the sclerotic lies a delicately thin vascular membrane named the *choroid coat,* having its interior surface lined with a black secretion termed the *pigmentum nigrum,* the probable use of which is to aid clear vision, by preventing a multiplicity of reflections in the bottom of the eye.

Still nearer to the centre of the eye lies the *retina,* which is continuous with the optic nerve, *f,* and is the part of the eye sentient to the impressions of light. Entering the bottom of the eye, but not just in its axis, is seen a thick cord, the *optic nerve,* by which the impressions upon the retina are conveyed to the brain.

The bulk of the eyeball is made up of three substances, which have been improperly termed *humours.* The first lies just within the cornea, and fills the space between it and the iris, as well as the smaller space immediately behind the latter. From its fluidity, it is termed the *aqueous humour, g.* The iris divides the chamber of the aqueous humour into an *anterior* and a *posterior portion.* The posterior wall of this chamber is formed by a delicate, transparent, capsular membrane, enclosing a lenticular body, convex on both sides, though more so posteriorly, which is named the *crystalline lens, l.* This body consists of concentric layers, formed of fibres externally less consistent, but increasing in density towards its centre; a structure intended for the purpose of correcting its *spherical aberration.* The capsule of the crystalline lens is retained in its situation by the *ciliary circle* or *ciliary processes;* and it lies imbedded in the most considerable of all the humours of the eye, the *vitreous, m,* which consists of a clear gelatinous substance, that recent anatomical investigations prove to be lodged in very delicate membranous cells. In the healthy state, especially in young persons, these humours are perfectly colourless and transparent, but they become coloured by age; and the crystalline lens has been seen in very old persons of a bright amber colour, though still transparent. Opacity of the lens forms the disease termed *cataract.* The obvious use of the humours of the eye is to refract the rays of light entering the eye by the transparent *cornea,* and to concentrate them on the *retina.* The difference in their consistence seems intended to make that organ a true and nicely adjusted achromatic optical instrument.



The ray from any object falling directly in the centre of the eye, perpendicular to its surface, will not undergo any refraction, but pass straight through to the retina; and its direction may be termed the *axis of the eye.* All the rays which fall obliquely on the eye will, by the refraction of the humours, be bent from their course, and cut the axis somewhere between the lens and the retina; and the refractive power of the humours is such as to converge on the retina all rays proceeding from any one point of a visible object, whether these rays fall on the cornea in a parallel or a diverging condition. But as these rays have all crossed the axis of the eye by the refractive power of the humours, it is obvious that the rays from the upper part of the object will impinge on the lower part of the retina, and those from the lowest point, on the upper part of that membrane. Hence the image of the object will be *inverted* on the retina. That this actually takes place we can easily satisfy ourselves, by removing from the posterior part of the eye of a sheep a portion of the sclerotic coat with a sharp knife, until it becomes translucent, when the image of a candle placed before the cornea will be seen inverted on the back part of the eye thus prepared.

In the usual state of the eye, its refractive apparatus is so contrived that all the rays from the same points of objects at some distance from the eye will *converge in the retina,* or the *principal focus of the eye will lie in that membrane;* but divergent rays from very near objects would converge in a point *behind the retina,* were there not some power of adjustment in the eye for correcting the confused image which would thus be formed. This may be effected in two ways; either by increasing the convexity of the cornea, or by bringing the lens to a greater distance from the retina. Some have attributed this adjustment to an alteration in the form of the eyeball, and consequently of the cornea, by the action of the motor muscles of the organ; but there is much more probability in the opinion that this adjustment is produced by the contractions and expansions of the *iris.* This part of the eye is attached to the ciliary ligament, which is also connected with the capsule of the crystalline lens. Hence contraction of the pupil would tend to draw forward the lens, or remove it farther from the retina; and thus the rays which have their point of convergence *behind* the retina, would meet in that membrane, and a distinct image would be produced. That some such adjustment is necessary is obvious; for if, after contemplating a distant object, our attention be suddenly turned to a very near one, it is some time ere the second object is distinctly perceived; and the movement of the iris will be seen to take place before the second image is well defined. The retina is capable of affording the perception of external objects in its whole extent, except at the insertion of the optic nerve, a spot about $\frac{1}{40}$th of an inch in diameter in man. Any image falling on this spot is invisible, as multiplied experiments have shown. This insensible point in either eye may be indicated by the familiar optical experiment of placing three coloured wafers horizontally on a wall, on a white ground, about two feet from each other. Let the operator place himself about two feet from the wall, opposite the middle wafer; shut one eye, and then gradually retire backwards, while he fixes his open eye on the wafer nearest the closed eye. When an ordinary eye is distant from the wall about *five times* the distance of the wafers from each other, the image of the middle wafer will have fallen on the insertion of the optic nerve, and will no longer be visible.

Two very interesting speculations connected with vision have long exercised the ingenuity of physiologists and metaphysicians, viz. how it happens that animals with two eyes see objects *single*, by means of double images on the retinæ; and how they appear *erect* by means of inverted images?

The first has been explained on the supposition of there being corresponding points in each eye that convey similar perceptions to the mind, and that such afford only the idea of *unity*. In the natural movements of the eyes, the images of external objects are supposed always to fall on such points; but should any cause throw the images on dissimilar points, then we have double vision. Hence, if with the finger we push one eyeball slightly out of its parallel position with regard to the other, two objects are perceived. In persons who squint, the parallel movement of the eyes is lost; and it has been supposed that in cases where the squinting has come on in adults from imperfection in one eye, that habit enables the individual to correct the illusion of double vision, and that the person ceases to notice the impressions made on the least perfect of the two eyes.

The second fact alluded to is that of *erect* vision by *inverted* images. That images of external objects are depicted inverted on the retina is perfectly well ascertained; and philosophers have been much puzzled to explain how the indications of vision and touch are reconciled. Some have imagined that at first we really see objects inverted, but learn by experience and by the sense of touch to correct the illusion. Other attempts have been made to explain it by what has been termed the *law of visible direction;* by which it is supposed that when any point of an object is viewed, the rays proceeding from that point must fall on the eye with different degrees of obliquity, yet that point will be only seen in the direction of the central ray of the cone of light proceeding from that point: And as the lines of *visible direction* must necessarily cross each other at the centre of visible direction, those of the lower part of the image on the retina must go to the upper part of the object, and those of the upper part of the image to the lower part of the object; and hence an erect object is considered as the necessary result of an inverted image.

This is very ingenious, but it is obviously hypothetical and obscure. The physiological explication of single vision by double images suggested by Newton, and since supported by Wollaston, is based on what has been termed the *semi-decussation* of the optic nerves at their commissure, whereby the right half of the retina of each eye is placed in direct nervous communication with the right optic lobe, or right half of that part of the brain termed *corpora quadrigemina*, and *vice versa.* Hence impressions made on corresponding points in each retina may, in fact, be impressions on the *same points of the common sensorium*, and therefore co-operate in producing the same perception. The anatomical proof of this is still defective, but many facts give it probability. The subject has engaged the attention of Professor Alison of Edinburgh, who considers that this arrangement of the optic nerves is but a part of the provision by which nature has secured harmony between perceptions afforded by sight and touch. His explanation of one of the most perplexing questions in animal physiology is so ingenious, that we gladly avail ourselves of his permission to lay it before our readers.

According to him, the peculiar contorted or involuted course of the optic nerves (in all vertebrate animals) around the crura cerebri, until they are lost in the optic lobes, seems designed to secure that the position of the *impression on the sensorium* should be conformable to the true position of the object.

It is only in those animals intended by nature to contemplate objects with both eyes at once, as in mammalia and birds, that the semi-decussation of the optic nerve is found. The contrivance in fact implies that both eyes are to be at the same time directed to the same object, or that both optic lobes are to be constantly employed in vision at the same time; the right half of each retina being in connection with each optic lobe, and the left half of each retina in like manner connected with the left optic lobe. Now, the *right* half of each retina contains the image of the *left* half of the field of vision; and therefore the impressions made by the left half of the field of vision fall on the right optic lobe, and have, on their left, the impression resulting from the right side of the field of vision; on which, as both optic lobes are necessarily exercised together, the attention of the mind is equally directed.

Dr Alison considers that the grand contrivance adopted by nature to secure harmony between the indications of sight and touch is the *decussation at the pyramids* of the nervous fibres concerned in common sensation and in voluntary movements; the effect of which must be, that while the right side of the brain is that to which impressions from the left half of the field of vision are brought, it is also *that* on which all the other sensations of the left side of the body depend; or, in other words, *we both see and feel what is on our left by the right side of the brain.* Accordingly, it is in those animals only in which the semi-decussation of the optic nerves exists (namely, in *Mammalia* and birds) that the decussation at the pyramids exists, or that the sensations and voluntary motions of each side of the body appear to be in connection with the opposite side of the brain.

As the admirable mechanism of the eye, and its beautiful adaptation to the necessities and comfort of the animal creation, afford a striking instance of that wisdom and beneficence so conspicuous in the handywork of the Deity; so the extinction of this exquisite and important organ must be considered as one of the severest of human calamities; a misfortune that perhaps cannot be fully appreciated by those who have not experienced the loss of sight, so feelingly deplored by our mighty bard in poetry that can only perish with the language in which it is expressed.

Thus with the year
Seasons return, but not to me returns

Day, or the sweet approach of even or morn,
Or sight of vernal bloom or summer's rose,
Or flocks, or herds, or human face divine;
But cloud instead, and ever during dark
Surrounds me, from the cheerful ways of men
Cut off, and for the book of knowledge fair
Presented with an universal blank
Of nature's works, to me expunged and raz'd,
And wisdom at one entrance quite shut out.

Some of the works that treat of light are, Aristotelis *Opera de Anima et de Meteor.*; Senecæ *Opera*; Plinii *Hist. Nat.*; Euclidis *Optica*; Heliodorus Larissæus *De Opticis*; Alhazen, *Optica cum Comment.* Vitellionis; Baconis *Opus Majus*; Maurolycus *De Lumine et Umbra*; Baptista Porta, *Magia Nat. et de Refractione*; Bacon's *Works*; Antonio de Dominis *De Radiis Visus et Lucis*; Borelli *De Vero Telescopii Inventore*; Galileo Galilei, *Opere et Vita*; Kepler, *Paralipomena ad Vitellionem*; Schotti *Magia Universalis*; Descartes, *Opera*; Gassendi, *Opera*; Athan. Kircheri *Opera*; Huygenii *Opera*, also Snell's *Discoveries*; Newton's *Optics* and *Principia*; Boyle's *Works*; Hooker's *Micrographia*, and *Posth. Works*; Muschenbroeck's *Tentamina et Introd.*; Grimaldi *De Lumine*; Beccaria *Dell' Elettricismo*, &c.; Beccarii *Comment. de Phosphoris*; Bouguer, *Traité d' Optique*; Lambert, *Photométrie*; Montucla, *Histoire des Mathématiques*; Smith's *Optics*; Priestley *on Vision*; Hutton *on Light*; Cavallo's *Philosophy*; Leslie *on Heat*; Biot, *Traité de Physique*; Muncke, *Handbuch der Naturlehre*; Treviranus, *Beitrache zur Lehre von den Gesichtwerkzengen und dem Sehen*; *Mémoires de l'Acad. Royale des Sciences*; *Mémoires de l'Institut, et de l'Acad. des Sciences*; *Phil. Trans. London*; *Phil. Trans. Edin.* (I. I. I.)

Light-Horse, an ancient term, signifying an ordinary cavalier or horseman lightly armed, in opposition to the men-at-arms, who were heavily accoutred, and armed at all points.

Light-House, a building erected upon a cape or promontory upon the sea-coast, or upon some rock in the sea, and having on its top in the night-time a light, such as to be seen at a great distance from the land. As the British light-house system is at present under the consideration of parliament, we feel that it would be premature and unsatisfactory to give any article under this head; and we are therefore under the necessity of referring to another, viz. that of SEA-LIGHTS, where the whole subject will be fully discussed.

Light-Room, a small apartment, enclosed with glass windows, near the magazine of a ship of war. It is used to contain the lights by which the gunner and his assistants are enabled to fill cartridges with powder to be ready for action.

LIGHTER, a large, open, flat-bottomed vessel, generally managed with oars, and employed to carry goods to or from a ship when she is to be laden or delivered. There are also some lighters furnished with a deck throughout their whole length, in order to contain those merchandises which would be damaged by rainy weather. These are usually called *close lighters.*

LIGHTFOOT, JOHN, a learned English divine, was the son of a divine, and born in March 1602, at Stoke-upon-Trent, in Staffordshire. After having finished his studies at a school on Morton Green, near Congleton in Cheshire, he was removed in 1617 to Cambridge, where he applied himself to the study of eloquence, and succeeded so well as to be thought the best orator among the under graduates in the university. He also made extraordinary proficiency in the Latin and Greek, but neglected the Hebrew, and even lost that knowledge of it which he brought from school. His taste for the oriental languages was not yet excited; and as for logic, the study of it, as conducted at that time among the academics, was too disputatious and fierce for his meek disposition. As soon as he had taken the degree of bachelor of arts, he left the university, and became assistant in a school at Repton in Derbyshire. Having held this situation a year or two, he entered into orders, and became curate of Norton-under-Hales, in Shropshire. This curacy occasioned an awakening of his genius for the Hebrew tongue. Norton lies near Bellaport, then the seat of Sir Rowland Cotton, who being his constant hearer, made him his chaplain, and took him into his house. This gentleman, being a perfect master of the Hebrew language, engaged Lightfoot in that study; and, by conversing with his patron, he soon became sensible, that without that knowledge it would be impossible to attain to an accurate understanding of the Scriptures. Having, therefore, applied himself to it with extraordinary vigour, he in a little time made great progress; and his patron removing with his family to reside in London, he followed his preceptor to that city. But he did not stay long there; for, having a mind to improve himself by foreign travel, he went down into Staffordshire, in order to take leave of his father and mother. But passing through Stone in that county, and finding the place destitute of a minister, he was prevailed on by the pressing entreaties of the parishioners to undertake that cure; and having laid aside his design of travelling, he began to turn his thoughts to settling at home. During his residence at Bellaport, he had made the acquaintance of a gentlewoman, the daughter of Mr William Crompton of Stonepark, and being now in possession of that living, he married her in 1628. But notwithstanding this settlement, his unquenchable thirst after rabbinical learning would not suffer him to continue there; and Sion College library at London being well stocked with books of that kind, he quitted his charge at Stone, and removed with his family to Hornsey, near the city, where he gave the public a specimen of his advancement in those studies, by his *Erubbim, or Miscellanies Christian and Judaical*, in 1629. He was at this time only twenty-seven years of age, and appears to have been well acquainted with the Latin and the Greek fathers, as well as the ancient heathen writers. These first fruits of his studies were dedicated to Sir Rowland Cotton, who, in 1631, presented him to the rectory of Ashley, in Staffordshire.

Considering himself as now fixed for life, he built a study in the garden, to be out of the noise of the house, and applied himself with indefatigable diligence in searching the Scriptures. Thus employed, the days passed agreeably; and he continued quiet and unmolested, till the great change which happened in public affairs brought him into a share of the administration relating to the church; for he was nominated a member of the memorable assembly of divines for settling a new form of ecclesiastical polity. This appointment was the effect of his distinguished merit; and he accepted it solely with a view to serve his country, as far as lay in his power. The non-residence which this would necessarily occasion, apparently induced him to resign his rectory; and having obtained the presentation for a younger brother of his own, he set out for London in 1642. Having now satisfied himself in clearing up many of the most abstruse passages in the Bible, and provided the chief materials, as well as formed the plan, of his *Harmony*, an opportunity of inspecting it at the press was no doubt an additional motive for his going to the capital, where he had not been long before he was chosen minister of St Bartholomew's, behind the Royal

Lightfoot.

Exchange. The assembly of divines having met in 1643, our author attended diligently there, and made a distinguished figure in their debates, where he used great freedom, and gave signal proofs of his courage as well as learning, in opposing many of those tenets which the divines were endeavouring to establish. His learning recommended him to the parliament, whose visitors, having ejected Dr William Spurstow from the mastership of Catharine Hall in Cambridge, put Lightfoot in his room, in the year 1653; and he was also presented to the living of Much-Munden in Hertfordshire, void by the death of Dr Samuel Ward, Margaret-professor of divinity in that university, before the expiration of this year. Meanwhile he had his turn with other favourites in preaching before the House of Commons, most of which sermons were printed; and in them we see him warmly pressing the speedy settlement of the church in the Presbyterian form, which he cordially believed to be according to the pattern in the Gospel. He was all the while employed in preparing and publishing the several branches of his *Harmony*, which were so many excellent specimens of the usefulness of human learning to true religion; but he met with great difficulties and discouragements in that work, chiefly from that spirit of hostility to erudition which then prevailed, and even threatened the destruction of the universities. In 1655 he entered upon the office of vice-chancellor of Cambridge, to which he was chosen that year, having taken the degree of doctor of divinity in 1652. He performed all the regular exercises for his degree with great applause, and executed the vice-chancellor's office with exemplary diligence and fidelity; and, particularly at the commencement, supplied the place of professor of divinity, then undisposed of, as an act which was kept for a doctor's degree in that profession. At the same time he was engaged with others in perfecting the Polyglott Bible, then in the press. At the Restoration he offered to resign the mastership of Catharine Hall. But, as what he had done had been rather in compliance with the necessity of the times than from any zeal or spirit of opposition to the king and government, a confirmation was granted to him by the crown, both of the place and of his living. Soon after this he was appointed one of the assistants at the conference upon the liturgy, which was held in the beginning of 1661, but attended only once or twice; being probably disgusted at the heat with which that conference was managed. However, he stuck close to his design of perfecting his *Harmony;* and being of a strong and healthy constitution, which was assisted by a strict temperance, he prosecuted his studies with unabated vigour to the last, and continued to publish, notwithstanding the many difficulties he met with from the expense of the work. However, not long before he died, some booksellers got a promise from him to collect and methodise his works, in order to print them; but the execution was prevented by his death, which happened on the 6th of December 1675. Dr Lightfoot was twice married; and his first wife brought him four sons and two daughters. His second wife was likewise a widow, relict of Mr Austin Brograve, uncle of Sir Thomas Brograve, of Hertfordshire, a gentleman well versed in rabbinical learning, and a particular acquaintance of our author; but he had no issue by her. She died before him, and was buried in Munden church, where he was himself likewise interred near both his wives. Dr Lightfoot's works were first collected and published in 1684, in two volumes folio. The second edition was printed at Amsterdam, 1686, in two volumes folio, containing all his Latin writings, with a Latin translation of those which he wrote in English. At the end of both these editions there is a list of such pieces as he left unfinished. It is the chief of these, in Latin, which make up the third volume, added to the former two, in a third edition of his works, published by John Leusden, at Utrecht, in 1699, folio. They were communicated by Mr Strype, who, in 1700, published another collection of these papers, under the title of Some Genuine Remains of the late pious and learned Dr John Lightfoot.

Lighting of Streets.

LIGHTING of Streets. This invention, which is generally considered as of modern date, contributes greatly to the convenience and safety of the inhabitants of large cities, as well as to the ornament of their streets. It is not probable that the streets of ancient Rome were lighted, since the Romans considered the use of flambeaux and lanterns as necessary in returning home from their nocturnal visits. It appears that such as walked the streets without these went home in darkness; and the return of Gito in the night time, of which Petronius makes mention, clearly proves that the streets of Naples were not lighted. Those who have ascribed to a remote antiquity the lighting of streets, seem to have mistaken it for illuminations, which indeed were of great antiquity. Egyptians, Jews, Greeks, and Romans, during the celebration of memorable festivals, were in the habit of illuminating their houses; but this is entirely different from the practice which we are now considering.

Paris was probably the first city in modern times, the streets of which were lighted about the beginning of the sixteenth century, as they were much infested by robbers and incendiaries. This occasioned an edict, issued in 1524, commanding the inhabitants, whose windows fronted the street, to keep lights burning after nine o'clock at night. In 1558, these were changed for lanterns, of a similar construction with those used at present. In 1671 the lanterns were ordered to be lighted every year from the 20th October to the end of March the ensuing year. Some time after this a premium was offered for a dissertation on the best means of improving the lighting of the streets, when a journeyman glazier obtained a premium of 200 livres, and MM. Bailly, Le Roy, and Bourgeois de Chateaublanc, 2000 livres. The lamps of Paris amounted in 1721 to 5772, and in 1771 to 6232. The city of Nantes was lighted in 1777, and had no fewer than 500 lamps in the year 1780.

The inhabitants of the city of London were ordered, in 1688, to hang out lanterns duly at the accustomed time, which order was renewed in 1690; and in 1716 it was enacted that all those whose houses fronted any street, lane, or public passage, should hang out one or more lights, which were to burn from six o'clock till eleven. By another act, the lamps were increased from 1000 to 4769, and afterwards to 5000. But as these were confined to the city and liberties, about one fifth of the whole of London, the number of lamps could not be less than 15,000. The continuance of their burning was also increased from 750 to 5000 hours. In 1744, another act was obtained to regulate still farther the lighting of the city, and it was placed on the footing on which it stood until the introduction of gas-light. Birmingham was lighted for the first time in 1733, with 700 lamps.

In 1669 Amsterdam was lighted by lanterns; the Hague in 1553 was lighted in a particular manner, but lamps were not fixed up in all the streets till the year 1678. The streets of Copenhagen were lighted in 1681, and the plan of lighting was much improved in 1683. Vienna began to be lighted in 1687, and lamps were introduced in 1704. In 1776 their number amounted to 2000, which was increased to 3000, to be lighted at the annual expense of 30,000 florins. Leipzig was lighted in 1702, Dresden in 1705, Cassel in 1721, and Göttingen in 1735. A practice so beneficial to the safety and convenience of mankind has been very laudably imitated by almost every city and town in Europe.

By far the greatest improvement that has been made in the lighting of cities is the application of coal-gas to this purpose. See the article GAS-LIGHTS.

LIGHTNING, a bright and vivid flash of fire, suddenly appearing in the atmosphere, and commonly disappearing in an instant, sometimes attended with clouds and thunder, and sometimes not.

Lightning was looked upon as sacred both by the Greeks and Romans, and was supposed to be sent to execute vengeance on the earth. Hence persons killed with lightning, being considered as hateful to the gods, were buried apart by themselves, lest the ashes of other men should receive pollution from them. Some say they were interred upon the very spot where they died; others think that they had no interment, but were suffered to rot where they fell, because it was unlawful for any man to approach the place. For this reason the ground was hedged in, lest any person should unawares contract pollution from it. All places struck with lightning were carefully avoided and fenced round, from an opinion that Jupiter had either taken offence at them, and fixed upon them the marks of his displeasure, or that he had, by this means, pitched upon them as sacred to himself. The ground thus fenced about was called by the Romans *bidental*. Lightning was much observed in augury, and was a good or bad omen, according to the circumstances attending it.

LIGULATED, amongst botanists, is an appellation given to such floscules as have a straight end turned downwards, with three indentures, but not separated into segments.

LIGURIA, in *Ancient Geography*, a country of Italy, bounded upon the south by the Mediterranean Sea, upon the north by the Appenine Mountains, upon the west by part of Transalpine Gaul, and upon the east by Etruria. There is a great disagreement amongst authors concerning the origin of the Ligurians, though most probably they were descended from the Gauls. Some carry back their origin as far as the fabulous heroes of antiquity; whilst others trace them from the Ligyes, a people mentioned by Herodotus as having attended Xerxes in his expeditions against Greece. These Ligyes were by some ancient geographers placed in Colchis, and by others in Albania. According to Diodorus Siculus, the Ligurians led a very wretched life; their country being entirely overgrown with woods, which they were obliged to pull up by the roots, in order to cultivate their land, which was also encumbered with great stones, and, being naturally barren, made but a very poor return for their labour. They were much addicted to hunting; and, by a life of continual exercise and labour, became so strong, that the weakest Ligurian was generally an overmatch for the strongest and most robust amongst the Gauls. The women are said to have been almost as strong as the men, and to have borne an equal share in all laborious enterprises. With all their bravery, however, they were not able to resist the Roman power, but were subdued by that warlike nation about 211 B.C.

LILBURNE, JOHN, an enthusiastic demagogue, who was tyrannically punished by the star-chamber court, being put in the pillory, whipped, fined, and imprisoned, for importing and publishing seditious pamphlets, printed in Holland, and which chiefly reflected on the church of England and its bishops. He suffered imprisonment in 1637, and in jail was doubly loaded with irons. In 1641, he was released by the long parliament; and from this time he had the address to make himself formidable to all parties, by his bold and aspiring genius. He signalized himself in the parliament army; and was at one time the secret friend and confidant of Cromwell, and at another his avowed enemy and accuser; so that, in 1650, Cromwell found it to be his interest to silence him, by a grant of some forfeited estates. But after this he grew outrageous against the protector's government; became the chief of the levellers; and was twice tried for high treason, but acquitted by the juries. The last trial of Lilburne was for returning from exile without a pass, after having been banished by the parliament. He died in 1657, aged eighty-eight.

LILIACEOUS, in *Botany*, an appellation given to such flowers as resemble those of the lily.

LILLO, GEORGE, an excellent dramatic writer, was born at London in 1693. He was a jeweller by profession, and followed his business for many years in that neighbourhood with a fair reputation. He was at the same time strongly attached to the muses, yet seemed to have laid it down as a maxim, that the devotion paid to them ought always to tend to the promotion of virtue, morality, and religion. In pursuance of this aim, Lillo was happy in the choice of his subjects, and showed great power of affecting the heart, by working up the passions to such a height as to render the distresses of common and domestic life equally interesting to the audiences with those of kings and heroes, and the ruin brought on private families by an indulgence of avarice, lust, and other passions, with the havoc made in states and empires by ambition, cruelty, or tyranny. His George Barnwell, Fatal Curiosity, and Arden of Feversham, are all planned on common and well-known stories; yet they have perhaps more frequently drawn tears from audiences than the more pompous tragedies of Alexander the Great, All for Love, and others of the same stamp. In the prologue to Elmeric, which was not acted till after the author's death, it is said, that when he wrote that play, he was depressed by want and afflicted by disease; but in regard to the former particular, there appears to be evidently a mistake, as he died possessed of an estate of L.60 a year, besides other effects to a considerable amount. His death happened in 1739, in the forty-seventh year of his age. His works have been collected and published, with an account of his life, in two vols. 12mo.

LILLY, JOHN, a dramatic poet, was born in the Wealds of Kent, about the year 1553, and educated in Magdalen College, Oxford, where he took the degree of bachelor of arts in 1573, and that of master in 1575. From Oxford he removed to Cambridge; but how long he continued there is uncertain. On his arrival in London, he became acquainted with some of Queen Elizabeth's courtiers, by whom he was caressed and admired as a poet and a wit; and her majesty, on particular festivals, honoured his dramatic pieces with her presence. His plays are nine in number. His first publication, however, printed in 1580, was a romance called *Euphues*, which was universally read and admired. This romance, which Blount, the editor of six of his plays, says, introduced a new language, especially amongst the ladies, is, according to Berkenhout, in fact a most contemptible piece of affectation and nonsense. Nevertheless it is very certain, that it was in high estimation amongst the women of fashion of those times, who, we are told by Whalley, the editor of Ben Jonson's works, had all the phrases by heart; and those who did not speak *Euphuism* were as little regarded at court as if they could not speak French. "He was," says Oldys, "a man of great reading, good memory, ready faculty of application, and uncommon eloquence; but he ran into a vast excess of allusion." When or where he died is not known. Anthony Wood says he was living in 1597, when his last comedy was published. After attending the court of Queen Elizabeth for thirteen years, notwithstanding his reputation as an author, he was under the necessity of petitioning the queen for some small stipend to support him in his old age. His two letters or petitions to her majesty on this subject are preserved in manuscript.

LILLY, *William*, a noted English astrologer, was born in 1602 in Leicestershire, where his father not being able to give him more learning than common writing and arithmetic, he resolved to seek his fortune in London. He arrived in 1620, and lived four years as a servant to a mantua-maker in the parish of St Clement Danes; but he then moved a step higher to the service of Mr Wright, master of the Salters' Company in the Strand; and as he was not able to write, Lilly, amongst other offices, kept his books. In 1627, when his master died, he paid his addresses to the widow, whom he married with a fortune of L.1000. Being now his own master, he followed the puritanical preachers; and turning his mind to judicial astrology, became the pupil of one Evans, a profligate Welsh parson, in that pretended art. Getting a manuscript of the *Ars Notitiæ* of Cornelius Agrippa, with alterations, he drank in the doctrine of the magic circle, and the invocation of spirits, with great eagerness. He was the author of the *Merlinus Anglicus junior*, the Supernatural Sight, and the White King's Prophecy. In him we have an instance of the general superstition and ignorance that prevailed in the time of the civil war between Charles I. and his parliament; for the king consulted this astrologer to know in what quarter he should conceal himself, if he could escape from Hampton Court; and General Fairfax, on the other side, sent for him to his army, to ask him if he could tell by his art, whether God was with them and their cause. Lilly, who made his fortune by favourable predictions to both parties, assured the general that God would be with him and his army. In 1648, he published his treatise of the Three Suns seen the preceding winter; and also an astrological judgment upon a conjunction of Saturn and Mars. This year the council of state gave him in money L.50, and a pension of L.100 per annum, which he received for two years, and then resigned on some disgust. In June 1660, he was taken into custody by order of the parliament, by whom he was examined concerning the person who had cut off the head of King Charles I. The same year he sued out his pardon under the great seal of England. When the plague raged in London, he removed with his family to his estate at Hersham; and in October 1666, he was examined before a Committee of the House of Commons concerning the fire of London, which happened in September that year. After his retirement to Hersham, he applied himself to the study of physic, and, by means of his friend Mr Ashmole, obtained from Archibald Sheldon a license for the practice of it. A little before his death he adopted for his son, by the name of Merlin the Younger, one Henry Coley, a tailor by trade; and at the same time gave him the impression of his almanack, after it had been printed for thirty-six years. He died in 1681 of a dead palsy. Mr Ashmole placed a monument over his grave in the church of Walton-upon-Thames. His Observations on the Life and Death of Charles, late king of England, if we overlook the astrological nonsense, may be read with as much satisfaction as more celebrated histories; Lilly being not only very well informed, but strictly impartial. This work, with the Lives of Lilly and Ashmole, written by themselves, were published in one volume 8vo, in 1774, by Mr Burman.

LILYBÆUM, in *Ancient Geography*, a city of Sicily, situated on the most westerly promontory of the island, and said to have been founded by the Carthaginians on their expulsion from Motya by Dionysius, tyrant of Syracuse. It is remarkable for the three sieges it sustained; one by Dionysius the tyrant, another by Pyrrhus, king of Epirus, and the third by the Romans. The first two failed in their attempts, but the Romans with great difficulty made themselves masters of it. No remains of this once stately city are now to be seen, except some aqueducts and temples.

LILYE, WILLIAM, a grammarian, was born in the year 1466 at Oldham in Hampshire, and in 1486 admitted a semi-commoner of Magdalen College, Oxford. Having taken the degree of bachelor of arts, he left the university, and travelled to Jerusalem. Returning thence, he continued five years in the island of Rhodes, where he studied the Greek language, several learned men having retired thither after the taking of Constantinople. From Rhodes he travelled to Rome, where he improved himself in the Greek and Latin languages, under Sulpitius and Sabinus. He then returned to London, where for some time he taught a private grammar-school, being the first person who taught Greek in the metropolis. When Dr Colet founded St Paul's school, 1510, Lilye was appointed the first master; at which time, it seems, he was married, and had many children. In this employment he had laboured twelve years, when, being seized by the plague, which then raged in London, he died in February 1523, and was buried in the north yard of St Paul's. He had the character of an excellent grammarian, and a successful teacher of the learned languages. His principal work is *Brevissima Institutio, seu ratio Grammatices cognoscendæ*, London, 1513, reprinted times without number, and commonly called Lilye's Grammar. The English rudiments were written by Dr Colet, Dean of St Paul's; and the preface to the first edition, by Cardinal Wolsey. The English syntax was written by Lilye, and also the rules for the genders of nouns, beginning with *propria quæ maribus*, and those for the preterperfect tenses and supines, beginning with *As in presenti*. The Latin syntax was chiefly the work of Erasmus. (See Ward's preface to his edition of Lilye's Grammar, 1732.)

LIMA, a department of the republic of Peru, in South America, bounded on the north by Truxillo, on the east by Junin and Ayacucho, on the south by Arequipa, and on the west by the Pacific Ocean. The Cordillera of the Andes ranges along its eastern side. The climate is considered as fine; and although the atmosphere is cloudy and humid, it seldom rains throughout the whole year. The heat is excessive along the coast; but as the country becomes more elevated towards the interior, the air becomes purer and more temperate. Earthquakes are frequent, from six to twelve occurring annually; and these convulsions of nature on a large scale seem to observe a periodical return at intervals of fifty years. It is watered by several streams, but none of any considerable size, the largest being the river Rimac, which, during the summer months, is much swollen by torrents from the Andes. The soil is good, and agricultural pursuits are followed to a considerable extent. The chief wealth of the country, however, consists in the produce of the mines, which are worked by proprietors in Lima. Next to Lima in importance is the sea-port of Callao, situated in the bay of that name, and containing a population of about 8000. The port is defended by three castles, which are surrounded with thick walls, a moat, and batteries of great strength. It is connected with the city of Lima by a straight road, about six miles in length. It was entirely destroyed by an earthquake in 1746, when upwards of 3000 of the inhabitants are said to have perished, and nineteen ships sunk in the harbour. Trade has lately much increased, and the town has greatly improved. Its appearance, however, is mean and unfavourable.

LIMA, a city in the department of that name, and capital of the republic of Peru, is situated in a spacious plain, on the southern bank of the river Rimac, about ten miles from the sea. Long. 76. 56. 45. W. Lat. 12. 3. S. The population, according to the latest accounts, is 40,000 inhabitants. It was founded in 1553 by Pizarro, who called it La Ciudad de les Reyes, or City of Kings; but the name has been since changed to Lima, a corruption of Rimac. The city is built in an amphitheatre formed by sierras of the great chain of the Andes, which shelter it from the northerly and easterly winds. The figure of the city is nearly semicircular, the river being the diameter, and is two miles long from east to west, and one and a quarter in breadth. It consists of 157 squares, and 355 streets, built at right angles, and about twenty-five feet wide. The streets are well paved, and furnished with streams of water, which are arched over, and rendered subservient to cleanliness and other conveniences. It stands nearly 700 feet above the level of the sea, and, when seen from Callao roads, presents a beautiful appearance, owing to its numerous domes and spires rising from so elevated a situation. The entrance is by a fine avenue or public walk called the Almeda, at the termination of which are the ruins of a handsome gate. It is surrounded by a brick wall, flanked with thirty-four bastions, but without embrasures. At the south-eastern extremity of the city is a small citadel, called Santa Catalina; and on the right side of the river, connected with the city by a bridge, is the suburb of San Lazarro, which is inhabited by the lower classes. The city having suffered much from earthquakes, the houses are generally built of one story, the walls being composed of mud and cut straw, formed into bricks by the heat of the sun, and strengthened by pieces of timber. The houses of the wealthy inhabitants, built in a Moorish style, generally consist of a square pile, two stories in height, enclosing a quadrangular court, which is surrounded with piazzas, and sometimes contains a second, or even third inner court. The Plaza, or great square, in the centre of the city, is surrounded partly with shops and private houses, and partly with public buildings. On the eastern side is the cathedral, to the north of which is the principal parish church, adorned with a beautiful façade, and adjoining it is the archiepiscopal palace, part of which is now occupied by the Peruvian synod. On the north side are the viceroy's palace and the city hall, under which is the city jail. In the centre of the square is a fine brass fountain, erected in 1653, the water of which being the best in Lima, is conveyed to all parts of the city. In this square the principal market is held. The cathedral is a noble edifice, and at each corner is a tower, nearly 200 feet in height. The interior is very rich, and the high altar has a magnificent appearance. The roofs of the houses, and domes and spires of the churches, are built of wood, covered with stucco-work, variously ornamented, which presents a splendid appearance when viewed from a distance; but the traveller is apt to feel disappointed upon a nearer inspection. Formerly the number of monks was reckoned at 1200, but they have now decreased nearly one fifth in amount. There are fourteen convents for females, and a number of religious houses, into which ladies retire for a short period. Some of the conventual churches are remarkably beautiful; that of St Domingo having a tower about 180 feet high, which is the loftiest in the city. There are several hospitals of a charitable and benevolent description. The university, founded in 1549, and possessing peculiar privileges, is a handsome building, with several good halls, and an extensive library.

The higher classes of the inhabitants are generally well educated, though in a limited sense; and the females are equally celebrated for their vivacity and beauty. They are said, however, to be somewhat licentious in their manners; and their walking-dress, consisting of a petticoat fitted close to the body, and a hood thrown over the head, seems peculiarly favourable to intrigue. Both sexes are addicted to smoking; but the females do not practise it openly. All classes of the inhabitants are extravagant in their dress, the richest stuffs of Europe being used even on ordinary occasions. Music, cards, and dancing, are the principal sources of amusement; bull-fights having been abolished. Gambling formerly prevailed in the higher circles; but this vice has of late sensibly diminished. The Spaniards of Lima are at present almost all creoles; the European Spaniards having quitted the country at the period of the revolution. There were formerly 15,000 slaves; but slavery was abolished in 1828 by the new constitution. Lima has been repeatedly laid in ruins by earthquakes, the most destructive of which were those of 1678 and 1746, when, out of 3000 houses, not more than twenty were left standing. In 1822 and 1828 also very destructive earthquakes occurred. The political events which have occurred in Lima will be fully detailed under the article Peru.

LIMASSOL, or Limisso, a town of Cyprus, in the south of the island. Of the ancient city, nothing but ruins now remain, though it was a celebrated place, even under the government of the dukes. King Richard, the conqueror of the last of these vassals of the empire, razed it in 1191, and it was never afterwards rebuilt. This city was originally the same as Amathus or Amathonte, so famous for its temple erected in honour of Venus and Adonis. Amathus was the residence of the first nine kings of the island, and amongst others of Onelistus, who was afterwards subdued by the arms of Artabanes, the Persian general. This city, erected into an archbishopric in the time of the Christians, has produced a number of personages celebrated for their knowledge and the sanctity of their lives. Richard, king of England, having destroyed Amathonte, Guy de Lusignan, in the twelfth century, laid the foundation of the new city which the Greeks called *Neopoleos*. The family of Lusignan, who continued to embellish and fortify it, built there palaces, besides Greek and Latin churches, and made it the seat of a bishop. When the island was taken by the Turks in 1570, the Ottoman army entered this city on the 2d of July, and ravaged it without mercy. It was then destroyed by fire.

LIMB, in general, denotes the border or edge of a thing. Thus we say, the limb of a quadrant, of the sun, of a leaf, and so forth.

Limb, in *Anatomy*, an appellation given to the extremities of the body, as to the arms and legs.

Limb, *Limbus*, *Limbo*, in the church of Rome, is used in two different senses. The limbo of the patriarchs is said to be the place where the patriarchs waited the redemption of mankind, and where they suppose our Saviour's soul continued from the time of his death till that of his resurrection. The limbs of infants dying without baptism, is a place supposed to be distinct from both heaven and hell; since they hold that children dying innocent of any actual sin, do not deserve hell, and, by reason of their original sin, cannot be admitted into heaven.

LIMBAT, the name of a periodical wind, common in the island of Cyprus, and of great service in moderating the heats of the climate, which would otherwise be intolerable.

LIMBORCH, Philip, a learned writer amongst the Remonstrants, was born at Amsterdam in 1633. After having made great proficiency in his studies, he was, in 1655, admitted to preach in public, which he did first at Haerlem. His sermons had in them no affected eloquence, but were solid, methodical, and edifying. He was chosen minister of Gouda, whence he was called to Amsterdam, where he held the professorship of divinity, in which he acquitted himself with great reputation till his death, which happened in 1712. He had many friends of distinction in foreign parts, as well as in his own country. Some of his letters to Mr Locke are printed along with those of that celebrated author. He had all the qualifications suitable to the character of a sincere divine, lived an example of every virtue, and preserved the vigour of his body and mind till a considerably advanced age. He wrote many estimable works, the principal of which are, 1. *Amica Collatio de veritate religionis Christianæ cum erudito Judæo*, in 12mo; 2.

a Complete Body of Divinity, according to the opinions and doctrines of the Remonstrants; and, 3. a History of the Inquisition, which was translated into English by Dr Samuel Chandler. Limborch also published the works of the famous Episcopius, who was his great-uncle by the mother's side.

LIMBURG, a city of the Netherlands, in the province of Liège, and arrondissement of Verviers. It is fortified, and stands on the river Besdre, and, including its suburb Dalhem, contains 320 houses, and 2000 inhabitants. Long. 5. 58. E. Lat. 50. 40. N.

LIMBURG, a city of the duchy of Nassau, in Germany, the capital of the bailiwick of that name. It is situated on the river Lahn, is surrounded with walls, and has the mint for the ducal coinage. It has some mineral springs, and contains 508 houses, with 2820 inhabitants. The neighbourhood produces the best wheat of any part of Germany.

LIMBURG, a province of the Netherlands, formed out of the greater part of the former French department of the Lower Meuse, and a small portion of the department of the Roer, to which has been added a portion of Dutch Limburg, part of the bishoprick of Liège, of Austrian and Prussian Guelders, and some small part of the duchies of Cleves and Juliers, with communes taken from the circle of Westphalia in Germany. It is now a compact district, extending over 1546 square miles, between north latitude 50. 44. and 51. 45. and between east longitude 4. 52. and 6. 5. It is a level plain, except that a few hills, of no great height, rise in the south-east division. The soil is generally fertile in the vale, through which the Meuse, its only navigable river, runs; but the north-western part consists chiefly of barren heaths. The parts of these heaths that are cultivated produce scarcely any grain, except buck wheat. The meadows on the banks of the Meuse, as well as the lands adjoining to them, where clover is grown, are adapted to the breeding and fattening of cattle; and their dairies, which are conducted on the plan of the Hollanders, produce excellent butter and cheese. Much rape seed is also raised for making oil, and the crops of hemp, flax, madder, chicory, and tobacco, are found profitable. Coals are obtained in some parts; and the quarries yield good stone, peculiarly adapted to building under water, for which there is a great demand in Holland. The manufactures of the province are inconsiderable, and confined chiefly to such articles as are of common domestic demand. There are in the province three arrondissements, divided into twenty-two cantons, and subdivided into 336 communes. The inhabitants, amounting to 292,500, are for the most part of the Walloon race; but the Dutch, Flemish, and Walloon dialects are almost equally spoken by them. The capital is Maestricht.

LIMERICK, a maritime county of the province of Munster, in Ireland, is bounded on the north by the estuary of the Shannon and the county of Tipperary, on the east by the same county, on the south by the county of Cork, and on the west by that of Kerry. In extent of surface it ranks as tenth amongst the counties of Ireland. It contains 674,783 acres, of which 582,802 acres are fit for cultivation, and only 91,981 are bog or unprofitable mountain.

It was formerly inhabited by the tribe of the Velaborii. The principal Irish families in it afterwards were the O'Briens, O'Gradys, O'Gormans, M‘Enerys, M‘Sheehys, Moronys, M‘Mahons, and O'Quins. Much of it was confiscated in the time of Cromwell, since which period the proprietorship of the soil has mostly devolved upon settlers of English descent. The county is now divided into the ten baronies of Clanwilliam, Upper and Lower Conello, Coonagh, Coshma, Costlea, Kenry, Owneybeg, Pubblebrian, and Small County, which are again subdivided into 126 parishes.

According to the ecclesiastical arrangements of the country, the county of Limerick comprehends portions of the dioceses of Limerick, Emly, Killaloe, and Cashel. The whole of the first named of these dioceses, a small portion excepted, is within the county; eighty-five of the parishes which constitute it being within its limits, and three only in the county of Clare. This see is one of the few which is unaffected by the changes introduced into the ecclesiastical divisions of Ireland by the late consolidation of the bishoprics. It is still, as before, to continue united with those of Ardfert and Aghadoe in Kerry. Its revenue is estimated at L.5369 per annum. The cathedral, an ancient and venerable pile, stands in the city of Limerick; and the bishop's palace, a modern mansion, is situated on the bank of the Shannon, at the western extremity of the city. The chapter consists of a dean, precentor, chancellor, treasurer, and archdeacon, and has eleven prebendaries and six vicars-choral connected with it. The see of Emly, united with that of Cashel, has thirty-eight parishes in the county of Limerick, and twenty in that of Tipperary. The seat of the see is in the latter county. One parish of the diocese of Cashel, and two of that of Killaloe, are within the limits of the county of Limerick.

The face of the country, though diversified by numerous small hills, is not mountainous, except on the south-east, where it is bounded by the Galtees, a ridge of considerable extent, and 2500 feet high at its most elevated point, extending into the adjoining county of Tipperary. On the borders of Kerry the surface also rises into a grand amphitheatre of low but steep mountains, that spread themselves out in a wide curve from Loghill to Drumcollogh. The only river of any size is the Maig, which rises in the Galtees, and discharges itself into the Shannon west of Limerick. It is navigable by barges as far as the town of Adare. A plan to make this river available for the purpose of connecting the cities of Limerick and Cork, by an inland navigation from Adare to Mallow on the Blackwater, has not been carried into effect. The Feale and the Gale, which rise in the western mountain range, are considered as belonging to Kerry, and the Blackwater, which rises in the same range, to Cork. The county is well watered by numerous smaller streams. Its only lake is Lough Gur, about five miles in circumference, and studded with several small islands.

The soil in the level parts is considered as the richest in Ireland. The Golden Vale, a district which obtained its name from the remarkable exuberance of its fertility, lies mostly in this county. Along the banks of the Shannon are large tracts of marsh land, called corcachs, also celebrated for their richness; a circumstance attributed to the quantity of alluvial mould deposited there by the Shannon when it overflows its banks. In a geological point of view the low country forms part of the great flœtz limestone plain of Ireland; but the mountainous district in the south and west consists chiefly of sandstone. A mine of coal or culm is worked at Loghill, but it is found to be better adapted for kilns than for domestic use. At Castleconnel, a town beautifully situated, is a mineral spa of great celebrity from its sanative effects. It is of the same quality as the Poutron at Spa.

The state of the population, at the different periods at which returns respecting it have been made, together with the authorities on which those returns depend, is as follows:—

1760	De Burgho	92,376
1792	Beaufort	170,000
1821	Parliamentary return	218,432
1832	Ditto	233,505

The returns from the commissioners of public instruction in 1834, being made in dioceses instead of counties, cannot be rendered available in this and the subsequent statement. The return of 1831 gives an average of one inhabitant to every two acres and eighty-eight hundred parts of the county in general, and to every two acres and thirty-five hundred parts of that portion of its land which is capable of profitable cultivation.

The state of education in 1821 and 1824–26 was as follows:—

Year.	Boys.	Girls.	Sex not ascertained.	Total.
1821,	16,510	7,896	—	24,406
1824–26,	19,173	10,347	568	30,088

Of the numbers in the latter of these statements, 2064 were Protestants of the established church, 27,735 were Roman Catholics, and 45 were dissenters; but the religious persuasion of 244 was not ascertained. The total number of schools was 461; of which 27, affording education to 2841 children, were maintained by grants of public money; 29, educating 3274 children, were supported by the voluntary contributions of societies or individuals, and the remaining 405 schools, in which 24,040 children were educated, depended wholly on the fees of the pupils.

The county returned eight members to the Irish parliament; two for the county at large, two for the city of Limerick, and two for each of the boroughs of Askeaton and Kilmallock. The boroughs having been disfranchised at the union, the number of representatives sent to the imperial parliament was fixed at three, two for the county and one for the city. The reform act has added one representative to the latter place.

The land in the level parts is divided into large farms, many of which are almost exclusively devoted to grazing. In the more hilly region the farms are smaller, and in some parts cut up into holdings much too small for the profitable culture of the soil, or the comfortable support of the cultivators. Still, however, the agricultural produce is considerable. Wheat, barley, oats, and rape, are raised in large quantities. In the year 1709, a colony of Palatines brought from Germany by Lord Southwell settled near Bruff, Rathkeale, and Adare. They tended much to improve the state of agriculture, as also that of the linen manufacture. The rich lands on the borders of the rivers produce a kind of flax very different from that of the north; it grows to a great height, and is well adapted for sail-cloth. Hemp was formerly cultivated extensively on the lands of the same quality. The horses are of large size, strong, active, and generally well bred; the heaviest and fattest beasts slaughtered in the southern markets are reared in this county. The sheep are also of a good description, but they are not bred here. Hogs of large size are sent to the same markets. The exportation of cattle and grain is very considerable, constituting the main source of the wealth of the inhabitants. The Shannon, which here assumes the character rather of an estuary of the ocean than of an inland river, supplies marine fish, both round and flat, in great abundance. Pike, carp, tench, trout of large size, and salmon highly esteemed for its flavour, are caught in most of the rivers.

The manners of the people are similar to those in other parts of the province. Their habits are almost exclusively agricultural. Their dwellings are poor, their food chiefly the potato; their fuel is turf, except near the collieries at Loghill, and in the immediate neighbourhood of the city, where British coal is much used. The Irish language is still spoken by the peasantry in their colloquial intercourse, but the English is universally understood and spoken, excepting perhaps in some of the more retired mountain districts.

The county possesses many remains of antiquity. The most remarkable of the ancient monastic buildings are in the city of Limerick, where, besides the cathedral, there was a Dominican friary founded by Carbreagh O'Brien, king of Thomond, in which he was interred. Some remains of the monument erected to his memory still exist. In the same city was an Augustinian friary, a convent of black nuns, a Franciscan friary, and a preceptory of knights-templars, besides several other minor religious establishments. Amongst the most admired of the many fine monastic ruins in various parts of the county is the the abbey of Adare.

The city of Limerick, the capital of the county, is situated on the Shannon, about 100 miles from its mouth, partly on an island and partly on the main land. It is the third city in Ireland in population and importance, being surpassed in these respects only by Dublin and Cork. The number of its inhabitants in 1821 and 1831 was 59,045 and 66,575 respectively. The city consists of three principal divisions; the Irish town, the English town, and Newtown Pery. The first is the most ancient, having been built before the arrival of the English in 1172. The second occupies King's Island, on the Shannon, and was formerly a strongly fortified position. The third was commenced in 1769, by Mr Sexton Pery, from whom it takes its name. It is laid out along the eastern banks of the river, in streets, intersecting each other at right angles with the utmost geometrical precision. The city was formerly considered as the strongest place in Ireland. In 1174 it was taken by the English, but shortly afterwards evacuated by them, and burned, to prevent its occupation being serviceable to the enemy. In 1651 it was taken by Ireton, Cromwell's lieutenant-general, after a vigorous resistance; and in 1690, its garrison baffled the army of King William, who conducted the siege in person; but it surrendered on terms the next year to General Ginckel, on which occasion the celebrated treaty of Limerick was concluded. Most of the walls and gates have been demolished, and quays, warehouses, and streets built on their site. The different parts of the town are connected with each other by bridges, of which Thomond Bridge is worthy of notice from its antiquity, and Wellesley Bridge, lately erected, still more so, as being one of the finest specimens of this kind of architecture in the island. Besides the cathedral, and three parish churches, and two chapels of ease of the established church, there are seven Roman Catholic places of worship. The methodists, presbyterians, baptists, independents, and quakers, have each a meeting-house. The court-house is a handsome building. The prison is constructed according to the modern improvements in prison discipline. The other more remarkable public buildings are the Tholsel, which is ornamented with a Tuscan colonnade, the custom-house, the commercial buildings, and the lunatic asylum. The city was originally incorporated by King John, whose charter was confirmed and extended by several succeeding sovereigns. It was first governed by a bailiff, but obtained the privilege of electing mayors and sheriffs ten years before that right was conferred on London. The city officers at present are, the mayor, two sheriffs, a recorder, four charter justices, to which the lord chancellor is empowered to add six more, and a common council, whose number fluctuates from thirty-seven to forty. This body is self-elective. It has also a military governor, constable, and town-major, and is a permanent military station. The jurisdiction of the city extends over a considerable space, the city and liberties comprehending twenty-one parishes or parts of parishes. One of the principal public institutions is the Chamber of Commerce, incorporated by charter and act of parliament. It is possessed of considerable property, a savings bank, and a mechanics' institute consisting of about 200 members. The charitable endowments are numerous, and some of them extensive. They are, the house of industry, which supports an average number of 336; the lunatic asylum, fever hospital, lying-in hospital, Magdalen asylum, dispensary, Barrington's hospital, Villars's alms-house, asylum for the blind, Hall's alms-houses, the forty-shillings alms-houses, Craven's charity, Mrs Rose's charity, and the jubilee, Pery, and London tavern loan funds. The trade of this place is extensive, and various linen, woollen, cotton, and paper manufactures are carried on in it. Several breweries, distilleries, and salt-works, find permanent employment. The exports chiefly consist of provisions and grain. The imports are, coal, turf, for the carrying of which from Clare and Kerry, 200 barges of twenty tons each are employed; timber, wine, spirits, and all the articles of British and foreign production which the wants or luxuries of a numerous and well-employed population require. Vessels of 400 tons' burden ride at the quay. The navigation from the Atlantic to the city is open and secure, and the inland navigation connects it with Dublin, and all the intermediate line of country. The estimated value of the exports and imports for 1832 was, exports L.1,005,727, imports L.289,596. Large quantities of merchandise are brought by the Grand Canal from Dublin.

The number of vessels that have cleared outwards from the port during a period of five years is as follows:

Year.	Vessels.	Tonnage.
1828	462	58,242
1829	334	42,591
1830	365	49,513
1831	423	52,316
1832	472	59,004

Eleven vessels, of about 1760 tons in all, belonged to Limerick ship owners in 1832.

The other towns of some note in the county are, Rathkeale, Shanagolden, Ballingarry, Newcastle, Adare, Askeyton, and Castleconnel. Kilmallock is more remarkable for its remaining vestiges of former greatness than for its present condition. It was the second town in the county, having a charter of incorporation, being surrounded by substantial fortifications, and consisting of a number of large houses, so durably constructed of cut stone, that their ruins have induced some modern topographers to distinguish the place, somewhat quaintly, by the title of the Irish Balbec.

Limerick is also the name of a fair-town in the county of Wexford and province of Leinster; the fairs are four in the year.

LIMIT, in a restricted sense, is used by mathematicians for a determined quantity to which a variable one continually approaches; in which sense, the circle may be said to be the limit of its circumscribed and inscribed polygons. In *Algebra*, the term *limit* is applied to two quantities, one of which is greater and the other less than another quantity; and in this sense it is used in speaking of the limits of equations, by which their solution is much facilitated.

LIMITED Problem denotes a problem that has but one solution, or some determinate number of solutions; as to describe a circle through three given points that do not lie in a right line, which is limited to one solution only; to divide a parallelogram into two equal parts by a line parallel to one side, which admits of two solutions, according as the line is parallel to the length or breadth of the parallelogram; or to divide a triangle in any ratio by a line parallel to one side, which is limited to three solutions, as the line may be parallel to any of the three sides.

LIMNING, the art of painting in water-colours, in contradistinction to painting executed in oil-colours.

Limning is by much the more ancient kind of painting. Till a Flemish painter, John van Eyck, better known by the name of *John of Bruges*, found out the art of painting in oil, the painters all painted in water and in fresco, both on walls, on wooden boards, and on other materials. When they made use of boards, they usually glued a fine linen cloth over them, to prevent their opening, then laid on a ground of white, and lastly mixed up their colours with water and size, or with water and yolks of eggs, well beaten with the branches of a fig tree, the juice of which thus mixed with the eggs; and with this mixture they painted their pieces.

In limning, all colours are proper enough, excepting the white made of lime, which is only used in fresco. The azure and ultramarine must be mixed with size or gum; but there are always applied two layers of hot size before the size colours are laid on. The colours are all ground in water, each by itself; and, as they are required in working, are diluted with size-water. When the piece is finished, they go over it with the white of an egg well beaten; and then with varnish if required.

LIMOGES, an arrondissement in the department of the Upper Vienne, in France, 769 square miles in extent. It comprehends nine cantons, divided into eighty-three communes, containing 89,500 inhabitants. The capital of the department, as well as that of the arrondissement, is the city of the same name, situated on the right bank of the river Vienne. It is ill built, with narrow and crooked streets, and very antique buildings. There is a fine Gothic cathedral, the façade of which is much admired. The episcopal palace and the mint are striking edifices. It contains 2570 houses, with 20,500 inhabitants. It is a place of great manufacturing industry, producing cotton twist, thin woollen and some linen goods; china-ware, scarcely excelled by that of Sevres; besides hats, wine, and copper articles. Long. 1. 10. E. Lat. 45. 49. N.

LIMOUX, an arrondissement of the department of the Aude, in France, 762 square miles in extent. It comprehends eight cantons, divided into 151 communes, and is inhabited by 71,800 persons. The capital is a city of the same name, situated in a district abounding in good wine, on the river Aude. It contains 1050 houses, and 6200 inhabitants, who make some of the finer descriptions of cloths, and convert to various purposes most of the iron that is found within the department. Long. 2. 11. E. Lat. 43. 5. N.

LINACRE, Thomas, a physician, was born at Canterbury about the year 1460, and educated there under the learned William Selling. He thence removed to Oxford, and in 1484 was chosen fellow of All-Souls' College. Selling, his former instructor, being at this time appointed ambassador from King Henry VII. to the court of Rome, Mr Linacre accompanied him to Italy, where he attained a high degree of perfection in the Greek and Latin languages. At Rome he applied himself particularly to the study of Aristotle and Galen, in the original. On his return to Oxford, he was incorporated doctor of physic, and chosen public professor in that faculty. But he had not been long in England before he was commanded by Henry VII. to repair to court, to attend the young Prince Arthur as his tutor and physician. He was afterwards appointed physician to the king, and after his death to his successor Henry VIII. Dr Linacre founded two medical lectures at Oxford, and one at Cambridge; but that which has most effectually immortalized his name amongst the faculty, is his being the founder of the College of Physicians in London. He beheld with vexation the wretched state of physic in those times; and, by an application to Cardinal Wolsey, obtained a patent in 1518, by which the physicians of London were incorporated. The intention of this corporation was to prevent illiterate and ignorant persons from practising the art of healing. Dr Linacre was the first president, and held the office as long as he lived. Their meetings were held in his own house in Knightrider Street, which he bequeathed to the college. But, when he was about the age of fifty, he took it into his head to study divinity, entered into orders, and, in 1509, was collated to the rectory of Mersham. In the same year he was installed as prebendary of Wells, in 1518 as prebendary of York, and in the following year was admitted precentor of that cathedral. This, we are told, he resigned for other preferments. He died of stone in the bladder in October 1524, at the age of sixty-four, and was buried in St Paul's. Thirty-three years after his death, Dr John Caius caused a monument to be erected to his memory, with a Latin inscription, which contains the outlines of his life and character. He was a man of great natural sagacity, a skilful physician, a profound grammarian, and one of the best Greek and Latin scholars of his time. Erasmus, in his epistles, speaks highly of his translations from Galen, preferring them even to the original Greek. His works are, 1. *De emendata Structura Latini Sermonis libri sex*, London, printed by Pynson, 1524, 8vo, and by Stephens, 1527, 1532; 2. Rudiments of Grammar, for the use of the Princess Mary, printed by Pynson, and translated into Latin by Buchanan, Paris, 1536. He likewise translated into Latin several of Galen's works, which were at different times printed abroad; also *Procli Diadachi Sphæra*, translated from the Greek, Venice, 1499, 1500.

LINCOLN, a city, the capital of the county of that name, 133 miles from London, situated at the bottom, on the side, and the top of a lofty hill, which rises from the banks of the river Wilham. It was formerly walled, and the castle, now converted into the county prison, still remains. The cathedral is on the summit of the hill, and is a most conspicuous object from an extensive surrounding country. It is a magnificent fabric, with two towers at the western front. It was found to be one of the richest in gold, silver, and precious stones, of any of the religious institutions of the kingdom in the reign of Henry VIII. and is still the seat of the largest of all the bishoprics. The city as a whole is not well built, and the streets leading from the lower to the upper town are too steep to be ascended by carriages, which make use of a circular road round the face of the hill, without the city. The town is governed by a mayor, twelve aldermen, and two sheriffs, and returns, as before, two members to parliament. The assizes and elections for the county are held here. It has no manufactures; and not much trade, what little there is, is carried on by the river Wilham, which has a communication with the Trent, through the Foss Dyke. The city has an exempted jurisdiction, within a circuit of nearly twenty miles. It contains, besides the cathedral, ten parish churches, and seventeen parishes. The inhabitants amounted in 1801 to 4909, in 1811 to 8861, in 1821 to 10,367, and in 1831 to 11,892.

LINCOLNSHIRE, an English maritime county. It is bounded on the north by Yorkshire, on the east by the German Ocean and Norfolk, on the south by Cambridge, Northampton, and Rutland shires, and on the west by Nottinghamshire and Leicestershire. Its greatest length is seventy-three miles, and its greatest breadth forty-eight. The area is 2814 square miles, or about 1,800,000 acres.

The county is divided into three districts or provinces. The largest of these, Lindsey, is more extensive than the other two, containing more than 1,000,000 acres, and stretching from the shores of the German Ocean to Nottinghamshire. It is rather an elevated tract of country, but the whole is so level as scarcely to contain a single hill. The north-eastern part of this division is a very extensive district of heathy land, generally very poor, especially the northern part of it, and denominated the Wolds. Though some parts of it have recently been brought into cultivation, yet a great portion has scarcely any other live stock than the numerous rabbits, which multiply in extended warrens. A small part, however, of this division, contains a rich tract of low land, formed by the rivers Trent, Dun, and Idle, where horned cattle are pastured, and some excellent flax is produced. The province of Lindsey is subdivided into fifteen hundreds and two sokes.

The province of Kesteven extends along the western side of the county, from its middle to its southern extremity; in which latter part is a portion of the fens. Notwithstanding there are many extensive heaths, especially near Lincoln and Ancaster; and though the soil and elevation are various, yet on the whole it may properly be described as a fertile country. Towards the west a ridge of hills, which forms an abrupt boundary, extends from Grantham nearly to Lincoln; but none of the points attains a great elevation. This province is subdivided into nine hundreds and three sokes.

The third province, Holland, contains the greater part of that unhealthy division of Lincolnshire usually called the *Fens*. It is subdivided into three hundreds, sometimes denominated sokes, sometimes wapentakes. The character of this province is similar to that of the province of the same name in the Netherlands, after which it has been called. Nearly the whole of it appears, at a remote period, to have been covered by the sea, and only brought into its present state of productiveness by the active and persevering labour of the inhabitants. The embankments and the draining have been expensive, perpetual, and progressive, and the soil that has been redeemed has conferred a most abundant remuneration. Excellent pasture land has been formed out of the swamps and bogs, and some of it produces extraordinary crops of corn, especially oats. Even in those parts that have not been reclaimed, the reeds, which abound, are converted into good covering for houses and barns, and they are well stocked with aquatic wild fowl. The taking of them is a profitable employment to many persons, and the markets of London are principally supplied from thence with those delicacies. The decoys in this district are more numerous than in any other part of England. They are commonly formed around quiet pools, to which pipes made of bent willows, and covered with nets, gradually enlarging as they approach the water, are conducted. Into the large orifice of the pipes the wild birds are enticed by tame ones trained for that business, and who conduct them into the funnel, when the appearance of a man or his dog behind drives them to the most contracted part, where they are taken. The quantity of birds taken in some seasons is prodigious, amounting to some hundreds of thousands. They usually consist of teal, widgeon, and wild ducks; but occasionally wild geese, godwits, coots, ruffs, and reeves and whimbrels, are caught. In these otherwise unproductive fens, the keeping of geese, principally for the sake of the feathers, is a considerable branch of rural industry, and supplies a large part of the demands of the kingdom, both for beds and for pens. The feathers are plucked from the birds at three, four, sometimes five different periods in the course of a year. This is thought a barbarous custom; but the charge of cruelty is denied by the breeders, who assert that, for their own profit, they pluck only those feathers which are so near falling off as to occasion little pain; those more firmly fixed, and which have some portion of blood at their end, being of very inferior value. The young ones are plucked as well as the old ones; experience having taught that, when plucked early, the future growth of the feathers becomes greater. During the breeding season, the birds are lodged in the same houses as their owners, in wicker pens, which are arranged in rows, frequently in the bed-chambers. A gooseherd in attendance on the flock leads them daily to water, and assists them, on their return, to get into their several cells. The attendants are acquainted with each individual goose in the flock, and can commonly distinguish them by the tones of their voices. Near Spalding there is a considerable heronry, and a smaller one near Surflet, where the herons, like rooks, build their nests on high trees.

The air in the fens is generally insalubrious, and the inhabitants suffer much from the nature of the water, which is generally of a brackish quality; and though they make reservoirs to preserve rain water, in dry summers they experience very great distress. In warm weather, vast swarms of insects add to the annoyances peculiar to this district.

The population, according to the returns at the four decennial enumerations, appear to have amounted in 1801 to 208,557, in 1811 to 237,891, in 1821 to 283,053, and in 1831 to 317,400. The annual value of the real property, as taken in 1815, amounted to L.2,061,830.

The burials, including both the registered and the unregistered, in the period from 1821 to 1831, appear to have been one in 53 of the whole number of inhabitants then living. The illegitimate births were one in nineteen of the whole born.

The occupations of the inhabitants, according to the returns arranged by Mr Rickman in 1831, were as follow:

Occupiers of land employing labourers	6,901
Occupiers of land not employing labourers	6,204
Labourers employed in agriculture	32,167
Labourers employed in manufactures	167
Employed in retail trade or handicraft	20,490
Capitalists, bankers, &c.	2,734
Labourers not agricultural	5,855
Other males twenty years of age	3,886
Male servants	1,848
Female servants	16,011

The towns containing more than 2000 inhabitants, and their population in 1831, were—

Lincoln, city	11,892
Boston, town	11,240
Lowth	6,927
Gainsborough	6,658
Stamford	5,837
Grantham	4,590
Grimsby	4,225
Horncastle	3,988
Holbeach	3,890
Long Sutton	3,510
Sleaford	2,450
Bourn	2,355
Crowland	2,268

The reform bill has left the city of Lincoln, and the boroughs of Boston, Stamford, and Grantham, with two members each, as before. It has left Grimsby with only one; and has divided the county into two districts, one called the Part of Lindsey, and the other the Part of Kesteven and Holland. The polling places for the former are Lincoln, Gainsborough, Epworth, Barton, Brigg, Market Rosin, Louth, Spilsby, and Horncastle; and for the latter, Sleaford, Boston, Holbeach, Bourn, Donington, Navenby, Spalding, and Grantham.

The capital of this county is the see of a bishop, whose jurisdiction is the largest of any in England, extending over the counties of Lincoln, Leicester, Huntingdon, Bedford, and Buckingham; over one half of Hertfordshire, and several portions of Oxfordshire, Berkshire, Rutlandshire, Northamptonshire, and Warwickshire; and including 1517 parishes, under the superintendence of six archdeacons.

The fens of Lincolnshire have running through them wide ditches, which serve to drain the water from the land, and which, when united and extended, become navigable, and highly beneficial as means of conveying the productions to the various markets. The Foss Dyke, the earliest canal made in Britain, was constructed in the year 1121, to form a connection between the city of Lincoln and the river Trent; and though, from the nature of the soil, it has been often obstructed, and the expense of keeping it in order has been great, it has continued to be used from that time to the present day. The river Trent, though rising in Staffordshire, may be considered as a Lincolnshire river, from the principal navigation upon it belonging to this county. It receives the Dun and the Ouse, and, before reaching the sea, unites with the Humber. It is navigable for large barges to Gainsborough. It has, upon the influx of the tide, a most extraordinary *bore*, or, as it is provincially termed, *eager*, when the waters run up resembling a wall with a rapidity that has no equal in any of our English rivers, except the Wye at Chipstow. The Witham rises within the county, about ten miles from Stamford. The early part of its course is through a beautiful district till it reaches the fen country, when its course becomes sluggish; but being navigable to Boston, it is highly beneficial both for draining and for commerce. The other rivers are the Ancholme, the Welland, the Glen, the Grant, and the Ouse. The Humber, indeed, is its boundary on part of the northern side; but is more commonly and properly considered as a Yorkshire than a Lincolnshire river, from Hull, its principal port, being in that county. Two small canals communicate with the river Witham, one from Horncastle, and the other from Sleaford.

The great bay or estuary into which the different rivers and dykes that drain the fens are disembogued, is very shallow, and filled with drifting sands, which render the approach to the shore highly dangerous. The rivers are constantly loaded with mud, and, in times of flood, encounter the tide, equally charged with its floating silt, which causes a stagnation and deposit that is constantly shifting its position, as the strength of the rivers or of the tides happens to be the more powerful.

The face of the country in the fens is generally uninteresting, exhibiting extensive plains, with nothing to break the continuity of the line of vision, and only rendered less monotonous by the vast numbers of cattle with which the green meadows are covered. On the wolds a more bleak and dreary prospect presents itself; but the western division of the country near Stamford and Grantham is variegated, woody, and undulating, and presents generally pleasing pictures.

The agriculture of the fens is of the simplest kind; for where nature has created such a productive soil, little remains to be done by the operations of man. In the more elevated parts of the county the cultivation is conducted with various, but, on the whole, good judgment; and the land produces ample crops of wheat, oats, barley, and beans, and in some parts hemp and flax. The attention, however, of the whole county is more turned to derive profit from cattle than from the use of the plough.

The oxen of Lincolnshire are proverbial for their goodness. The original race were of a great size, with large heads and short horns, thick in the bone, deep in the belly, short on the neck, high on the rump, and bare on the shoulders; but these have been improved by such various and judicious crossings of breeds, that their symmetry and excellent qualities render them the best in the island. Many cattle bred in other countries are fattened here on the rich natural pastures; but a portion of oil-cake is very commonly given, to fit them earlier for the market of Smithfield, to which numerous droves are weekly despatched. This fattening of cattle for the supply of London is so advantageous that the dairy is almost everywhere considered as a secondary object.

The sheep of this county are almost peculiar to it. They are of a large size, have horns, and produce heavy fleeces of long wool, highly prized in the manufacture of stuffs and some kinds of baizes. The flesh is, however, rank in flavour, and, unless the animals are improved by crossing with other races, is not generally relished. As the foundation of an excellent breed, they were selected by the late judicious Mr Bakewell, who, from mixing them with other races, produced those excellent sheep known by the name of the new Leicesters. The fleeces of the pure Lincolnshire sheep in general weigh from ten to twelve pounds; but extraordinary instances have been known in which they have attained more than twenty pounds.

The live stock, in which this county exceeds every other, is rabbits, which the numerous warrens on the wolds produce in vast numbers. From their prodigious quantity, the flesh is of small value, and the sale of the skins for the use of the furriers and hatters is the principal source of profit. The number of warrens has considerably diminished of late years, and the land they occupied has been appropriated to tillage ; but they are still very extensive.

Lincolnshire is not a manufacturing county. Before the extension of machinery, the spinning of their native wool gave occupation to the female part of the population ; but that employment has been nearly discontinued of late years, and no other has yet been substituted in its place. In some parts the flax is spun for domestic use. The nature of its sea-shores operates to prevent foreign commerce; and there is little or no intercourse between Lincolnshire and the ports even of Holland and Germany, which are opposite to it. The county produces neither minerals nor coals.

The antiquities of Lincolnshire are numerous, Almost all the churches are fine specimens of ancient architecture, a singularity which distinguishes them from those in every other county of England. The remains of Crowland, founded in 716, the seat of a mitred abbot, and anciently a place of great fame, are still visited by every antiquary; and near them is the triangular bridge over three streams, in good preservation. It is, however, so lofty and precipitous, that it is only useful to horse and foot travellers, as carriages usually pass under it. The other most prominent antiquities are, Torksey Castle, at the junction of the Foss Dyke with the Trent; Thornton Abbey, near the Humber; Bardney Abbey, on the banks of the Witham ; Tattershall Castle, on the same river ; and Somerton Castle, in the parish of Boothby.

Sir Isaac Newton, Lord Burghley, Lord Bolingbroke, Stukeley the antiquarian, and Wesley, the founder of Methodism, were, amongst many other eminent men, natives of this county.

The most remarkable seats of noblemen and gentlemen are, Blankney, Charles Chaplin, Esq.; Brocklesby Park, Lord Yarborough ; Coleby Hall, Earl Lindsey ; Gautby, Robert Vener, Esq. ; Grinsthorpe Castle, Lord Gwydir ; Hanby Hall, Sir William Manners ; Harmston, Samuel Thorold, Esq. ; Hainton Park, G. Heneage, Esq. ; Nocton Park, Earl of Ripon ; Belton House, Lord Brownlow ; Normanby Hall, Sir J. Sheffield ; Reevesby Abbey, late Sir Joseph Banks ; Subton, Sir Robert Heron ; Summer Castle, Lady Wrey ; Syston, Sir John Thorold ; Thurgunby, Lord Middleton.

LINDESFARN, or **Landisfarn**. See Holy-Island.

LINDSAY, Sir David, a Scotish poet of high reputation, descended from a younger branch of the family of Lord Lindsay of Byres, was the eldest son of David Lindsay, who possessed the estate of Garmylton in the county of Haddington, and that of the Mount in the county of Fife. The honour of the poet's birth belongs to Fifeshire,[1] but the date has not hitherto been ascertained. It appears that a student of the same name was admitted at St Andrews in the year 1505 : if we suppose this to be the same individual, and further suppose him to have been admitted at the age of fifteen, his birth is thus referred to the year 1490. This youth, whoever he may have been, was still a member of the university in 1508. Lindsay's father was then dead, and had left five sons. One of his biographers has sent him, after completing his academical studies, to prosecute his travels through England, France, Italy, and Germany ;[2] but this account seems to rest upon mere conjecture, rather than historical evidence. He himself informs us that he had travelled through divers countries, and he particularly mentions the appearance of the ladies in Italy ; but that he had visited those countries in his youth, is neither stated by himself, nor by any early writer with whom we are acquainted. When first employed in the king's household, he appears to have been still a very young man : in a poem addressed to James the Fifth, he takes occasion to state that he had entered into his majesty's service on the very day of his nativity, that is, on the 12th of April 1512. In the following year, we find him described as a " special servant" to that prince's father ; whom he attended at Linlithgow when a supposed apparition warned the devoted monarch of his approaching fate.[3] The tutor of the young king was Gavin Dunbar, afterwards archbishop of Glasgow, and chancellor of the kingdom.[4] The situation of Lindsay was that of a superior attendant : he is first described as usher to the prince, and afterwards, for several successive years, as the king's master usher. His wife, Janet Douglas, had for many years the charge of the king's linen.[5] In the dedication of his Dreme, he reminds James of the faithful services which he had rendered him in the tender years of his infancy ; and in the " Complaynt directit to the Kingis Grace," he prosecutes the same topics.

Lindsay was afterwards dismissed from his office ; and this event is supposed to have taken place in the year 1524, when the earl of Angus, who had married the queen dowager, regained his influence at court, and introduced such changes as were most conducive to his private views. His former services were not however forgotten, for he acknowledges that his pension continued to be regularly paid. Not satisfied with such a remuneration, he took occasion to bring his own merits under the king's review, and to acquaint him with his disposition to accept of any better preferment. In the Complaynt to which we have already referred, he contrived to convey a hint how a peerage might be very suitably bestowed. It is therefore sufficiently evident that this poet was not deaf to the calls of ambition, and that any addition to his rank or fortune would have been very acceptable. As he seems to have inherited a competent estate, and was not burdened with the maintenance of a numerous family, it is not easy to feel any deep sympathy for his disappointments and mortifications. The wants of a courtier, placed in such circumstances, are of so artificial and factitious a kind, that he must generally be left to bewail his own misfortunes. His remonstrances were not however ineffectual; he at length obtained an office of some dignity and emolument, that of chief herald, quaintly denominated lion king at arms. He afterwards received the honour of knighthood. In his new capacity, he was connected with various embassies. In the year 1531, he was employed in a mission to the emperor Charles the Fifth, whom he found residing at Brussels: this mission had a reference to the commercial intercourse between Scotland and the Netherlands. When the king afterwards became anxious to find a suitable consort, Lindsay repeatedly visited the continent: in 1535 he was connected with one embassy, which solicited a princess of the imperial family, and in the ensuing year with another, which solicited a daughter of the duke of Vendôme; but neither of those negotiations was followed by a treaty of marriage. The young and handsome prince next repaired to France as the bearer of his own proposals; and having soon attracted the warm regard of the king's daughter Magdalene, he married this sickly princess, who died within forty days after her arrival in Scotland.[1] The public joy was thus converted into public mourning; and on this melancholy event Lindsay composed a poem entitled "The Deploratioun of the Deith of Quene Magdalene." She died on the seventh of July 1537, and after an interval of eleven months James received another wife from the same country.

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[1] Andrew Robertson, in the preface to the Danish translation of Lindsay's poems, informs us that he was born in the county of Fife. " Hand vaar födt i Skotland vdi Fyff Stict."

[2] Mackenzie's Lives of Scots Writers, vol iii. p. 35.

[3] Buchanani Rerum Scoticarum Historia, p. 251. Lindsay's History of Scotland, p. 111.

[4] The subsequent entry occurs in the Treasurer's Accounts, 28th August 1517 : " Item to Maister Gawan Dunbar, the kingis maister, for expensis maid be him in reparaling of the chalmer in the quhilk the king leris now in the castell, iij. li."

[5] The Treasurer's Accounts contain many notices of Lindsay and his wife. Under the date of 1522, we find the following entry : " Item to Jonet Douglas, spous to Dauid Lindesay, maister ischeare to the king, for sewing of the kingis lynning claithis, de mandato domini gubernatoris, xxiiij. li." And under that of 1526 : " Item gevin that samyn to Dauid Lyndsays wife to sew the kingis sarkis v dowble hankis gold, l. s." She is then mentioned as " Jonet Dowglas, semestair of the kingis lynyng claithis." In 1537 she still had the charge of " the kingis sarkis ;" for under that date occurs the subsequent " Item, to Jonet Douglas, the spous of Dauid Lindesay of the Month, at the kingis grace command, as the precept beris, xl. li."

The reformation was now advancing with gradual steps; and Sir David Lindsay may certainly be classed among those who contributed to accelerate its progress: his writings tended to prepare the public mind for a systematic attempt to overthrow the papal superstition, and to introduce a more pure and rational form of worship. A species of devotion which rather engages the senses than the understanding, and which substitutes unmeaning observances for the vital power of religion, must always be regarded as having proceeded through a polluted channel. But the lives of the ecclesiastics were not less exposed to animadversion than their creed; nor was Lindsay destitute of skill in selecting proper topics of ridicule. His satire, and particularly his dramatic satire, must have had no inconsiderable effect in fostering the rising spirit of contempt for the clergy and their doctrines; and the papists were long disposed to number him among their most formidable enemies.[2] Nor was his ridicule entirely confined to his compositions. The king being one day surrounded by a numerous train of nobility and prelates, Lindsay declared himself a candidate for an office that had lately become vacant. "I have," said he, "servit your grace lang, and luik to be rewardit as others are; and now your maister taylor, at the pleasure of God, is departit; wherefore I wald desire of your grace to bestow this little benefite upon me." The king replied that he was amazed at such an application from a person who could neither shape nor sew. "Sir," rejoined the poet, "that maks nae matter; for you have given bishoprics and benefices to mony standing here about you, and yet they can nouther teach nor preach; and why may not I as weill be your taylor, thocht I can nouther shape nor sew, seeing teaching and preaching are nae less requisite to their vocation than shaping and sewing to ane taylor." James immediately perceived the object of his application, and did not scruple to amuse himself at the expense of the indignant prelates.[3]

Of the king he always speaks in terms of affection, though his admonitions are sometimes not very ceremonious. He was one of the few courtiers who witnessed the melancholy termination of his short career: oppressed by that sickness of heart which arises from a consciousness of fatal misconduct, James expired in the royal palace of Falkland on the 14th of December 1542, when he had only attained the thirty-first year of his age. The earl of Arran was soon afterwards appointed regent of the kingdom; and Lindsay is enumerated among those who adhered to him while he continued to act in conformity to the principles which they avowed. He was a member of parliament for the borough of Cupar in 1543, and the three succeeding years; and in 1544 he was again sent on an embassy to the emperor, for the purpose of delivering into his hands the insignia and statutes of the order of the Golden Fleece, which had been conferred on the late king. After an interval of four years, we find him employed on an embassy to Christian king of Denmark. One of his biographers avers that at Copenhagen he became acquainted with his countryman Dr Machabæus, and other men of learning,[4] nor is the supposition destitute of probability;

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[1] The Treasurer's Accounts contain the following statement of "The Expensis debursate upoun the Quenis Saullmes and Dirige quhom God assoilze."

Item to Sir Thomas Cragy and ane uther with him for making of iiij dosane of armes	iiij li.
Item to the bellman . . - . .	xviij d.
Item to the powpenny deliverit to David Lindsay, Lyoun Herald, ane croun of wecht	xx s.
Item to chaiplanis being at the dirige and saullmes the tyme of the obsequyis, ilk chaiplane havand ij s. extending to vij ^{xx}x, summa . . .	xv li.

[2] "Knoxii, Lindsayi, Buchanani, Villoxii, aliorum, impia scripta incautorum manibus teruntur: opus erat antidoto, ne latius venenum serperet." (Dempsteri Scotia illustrior, p. 54.)

[3] H. Charteris's pref. to the Warkis of the famous and worthie knight Sir Dauid Lyndsay of the Mont, alias Lyoun King of Armes. Edinb, 1582, 4to.—Of this very rare edition there is a copy in the Advocates Library. It was "imprentit at Edinburgh be Henrie Charteris;" and contains the same poems as the edition of 1592. The table of contents on the reverse of the title includes the Historie of Squyer Meldrum, which is not however to be found in the volume.

[4] Chalmers's Life of Lindsay, p. 37.—The name of Machabæus is otherwise connected with that of Lindsay. Ane Dialog betuix Experience and ane Courteour, off the miserabyll Estait of the Warld: compylit be Schir Dauid Lyndesay of the Mont, Knycht, alias Lyone Kyng of Armes, and is deuidit in foure partis, as eftir followis, &c. and imprentit at the command and expensis of Doctor Machabevs, in Copmanhouin, 1552, 4to. This first edition of the poem is however supposed to have been printed, not at Copenhagen, but at St Andrews by John Scott. John Machabæus, whose family name was Macalpine, was driven from Scotland by the persecution (Knox, p. 20.), and having sought refuge in Germany, he prosecuted his studies at Wittemberg and Cologne. At the suggestion of Melanchthon he adopted the name of Machabæus Alpinas. He took the degree of B.D. at Cologne; and on being appointed professor of divinity at Copenhagen in 1542, he took the degree of D. D. Here he died in the year 1557. (Worms Forsög til et Lexicon over Danske, Norske, og Islandske lærde Mænd, Bind ii. S. 2. Kiöbenhavn, 1771-84, 3 Bind. 8vo. Nyerups Al-

but it is always dangerous and always reprehensible to substitute mere conjecture for historical evidence.

Sir David Lindsay had decidedly espoused the cause of the reformers before they had become very formidable to the government; and it may perhaps be considered as remarkable that he escaped every species of persecution. In the year 1546, Cardinal Beaton, a prelate whose glaring vices were redeemed by very few virtues, was murdered in his own castle by a band of conspirators, who were partly instigated by private animosity, partly by public spirit, and who must all have been accustomed to contemplate without compunction this desperate method of inflicting punishment or perpetrating revenge. They were possessed of sufficient resources to garrison the castle of St Andrews, and to defend it against the royal forces for the space of fourteen months. To this strong hold John Knox repaired at Easter 1547; and at a conference which was there held, Lindsay was one of those who recommended the ordination of this distinguished individual,[1] in whom his penetration had doubtless discovered that energy of mind which qualified him for the arduous task that he was destined to perform.

The period of Lindsay's decease has not been ascertained. On the 17th of January 1555 we find him holding a chapter of heralds, for the purpose of investigating certain charges against a messenger-at-arms. He appears, according to one account, to have died between this period and the year 1558. As he died without issue, his estates descended to his brother Alexander; and they have long ceased to be inherited by the family of Lindsay.

Beside his poetical works, the chief foundation of his fame, he composed several others of less general interest. The nature of his office directed his attention to a species of knowledge which human folly has dignified with the name of science; and on the subject of heraldry he has left two different productions, one of which still continues in manuscript,[2] and the other, a curious collection of Blazonings, has lately been given to the public.[3] Bale informs us that he composed "Acta sui Temporis,"[4] and Mackenzie affirms that he was the author of a history of Scotland. For this statement he quotes the authority of Robert Lindsay of Pitscottie; who however refers to Sir David Lindsay, the knight of the Mount, and other individuals, as those from whom he had derived private information. Dr Leyden supposes Lindsay to be the author of the Complaynt of Scotland; but we have never yet met with a single enquirer who professed to be convinced by his arguments.

It is the poetry of Lindsay that chiefly recommends him to our notice, and he appears with no inconsiderable distinction in the literary annals of his country. Vernacular poetry was most successfully cultivated in Scotland when it was in a great measure neglected in England. An English critic of unquestionable taste has remarked that "the interval between the reigns of Henry V. and Henry VIII. which comprehends near a century, although uncommonly rich in Scotch poets of distinguished excellence, does not furnish us with a single name among the natives of England deserving of much notice."[5] When England produced only obscure versifiers, Scotland could boast of King James, Henry the Minstrel, Henryson, Dunbar, Douglas, Lindsay, and various other writers of genius. Sir David Lindsay has written so many verses that they cannot always be expected to reach a very high standard: his works indeed exhibit considerable inequalities; but where they are not distinguished by any superior force of imagination, they are often entertaining by their strokes of humour, or instructive by their views of life and manners. He was evidently a man of sense and observation, with serious impressions of virtue and piety; nor was he destitute of those higher powers of mind which enable a writer to communicate his ideas with effect. He frequently displays no mean vivacity of fancy; and the extensive and continued popularity to which he attained, must have rested on some solid foundation. Many of his poems have a satirical tendency; and the freedom with which he exposes vice, even when it belongs to royalty, has stamped his works with the character of intrepid sincerity. Of the state of society and manners, Lindsay presents us with many curious pictures; and although his delineations are sometimes extremely coarse, they are not on that account to be considered as less faithful. In this respect, his writings possess a peculiar value, and ought to be carefully examined by those who particularly direct their attention to the history of that period. The author's talents seem to have been cultivated with considerable assiduity: he was much conversant in history and divinity; and his knowledge of Latin writers, ancient as well as modern, was apparently respectable. His acquaintance with Grecian literature may perhaps be called in question: he denominates Hesiod the sovereign poet of Greece; a character which he could scarcely be expected to receive from any person acquainted with the language of Homer. Lindsay's versification is generally distinguished by its ease and fluency. His style often rises to a considerable degree of elegance, but on many occasions is overloaded with extraneous terms. This vicious taste was indeed too prevalent in both kingdoms: Hoccleve, Lydgate, and other successors of Chaucer, who possessed but a small portion of Chaucer's genius, endeavoured to render their diction poetical by the easy expedient of garnishing it with affected words, chiefly polysyllables of Latin origin; and the manner in which those words were applied, imparted a vague and tautological character to their most elaborate compositions. Dunbar, Douglas, and Lindsay were all infected with the prevailing taste, and have all exhibited specimens of this vitiated style. "It does not," says Dr Nott, "occur so frequently in Lindsay as in his contemporaries, because perhaps his subjects were mostly those of common life. Still, as it is to be found in those passages which aspire to elevation of thought, we must conclude him to have considered it the proper language of the higher walks of poetry."[6] This remark might be verified by many quotations from his poems; where we find

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mindeligt Litteraturlexicon for Danmark, Norge, og Island, S. 367. Kiöbenhavn, 1820, 4to.) He was respected for his learning, and is the author of some professional tracts, which are enumerated by these literary historians. His son Christian Machabæus, born at Wittemberg in 1541, published several Latin works in prose and verse. His last preferment was a prebend at Lund, where he died in 1598.

[1] Knox's Historie of the Reformatioun of Religioun, p. 67.

[2] Both his MSS. are preserved in the Advocates Library. That which is still unpublished bears the following inscription in the hand-writing of Sir James Balfour: "Collectanea Domini Dauidis Lindesay de Mounthe, Militis, Leonis Armorum Regis." Of this heraldic compilation a copious specimen has been inserted in Dr Leyden's Dissertation on the Complaynt of Scotland, p. 55. There is another MS. which the catalogue ascribes to the same author, but which evidently belongs to one of his successors.

[3] Fac-Simile of an ancient Heraldic Manuscript, emblazoned by Sir David Lyndsay of the Mount, Lyon King of Armes, 1542. Edinb. 1822, fol.

[4] Balei Scriptores Britanniæ, cent. xiv. p. 224.

[5] Ellis's Specimens of the Early English Poets, vol. i. p. 316.

[6] Nott's Dissertation on the State of English Poetry before the Sixteenth Century, p. cxcii.

such terms as formose, matutyne, mansweit, prepotent, consuetude, celsitude, pulchritude, immundicitie, and many others of a similar denomination.

The longest of his poems is entitled "Ane Dialog betwix Experience and ane Courteour, of the miserabill Estait of the Warld." This poem, which is otherwise described as the Monarchie, is indeed of great length: it is not however, as has sometimes been asserted, a tedious detail of well-known events, but a work replete with various learning, and enlivened by the remarks of an acute and reflecting mind. It appears to have been composed when the author had reached an advanced age, and may therefore be regarded as the result of much reflection on human life. It has been unfaithfully characterized as a meagre compendium of universal history: the poet's principal object is not to detail events, but, by referring to the great occurrences recorded in sacred and profane history, to illustrate general positions; and notwithstanding the great extent of his work, he can seldom be considered as languid or tedious. A Latin translation of the Monarchie was undertaken by David Carnegie of Aberdeen, who did not however live to complete the task.[1] The poem was translated into English, and repeatedly printed in London; and, along with other works of the author, was translated into Danish, and published at Copenhagen in the year 1591. The process of converting Lindsay's compositions into this language was somewhat peculiar: they were first translated into Latin prose by Andrew Robertson, and were afterwards translated into Danish verse by Jacob Mattssön.[2]

Lindsay's Dreme, which is supposed to be his earliest, has likewise been regarded as his most poetical composition. In the opinion of Warton, the prologue to this poem evinces strong talents for high description and rich imagery. His Complaynt, which is likewise addressed to the king, is a valuable and interesting production: it exhibits some lively sketches of the author's personal fortunes, of the prevalent manners of the times, and of the early history of James the Fifth. The mode in which the tender age of this hopeful prince was corrupted by the designing profligacy of his attendants, is painted in striking colours; and although the information is conveyed in rhyme, it seems to be nearly allied to historical accuracy. James was possessed of superior talents, and of a disposition capable of receiving a virtuous direction; but his education was interrupted at a critical period, and he was early initiated in vice by those who by every tie of decency were bound to inculcate the lessons of virtue. The king was himself a lover of poetry, and his court was frequented by poets: Lindsay and Bellenden belonged to the royal household; and he had sufficient discernment to appoint Buchanan the tutor of one of his natural sons. From Lindsay's "Answer to the Kingis Flyting," it appears that James was a writer of verses: he begins by stating that he had read his majesty's *ragment*, and proceeds to compliment him on his "ornate meter," proclaiming him the prince of poetry.

The "Supplication directit to the Kingis Grace, in contemptioun of side Taillis," is at least conspicuous for the author's zeal as a reformer of manners. He seems to have contemplated long trains and veiled faces with an unnecessary degree of alarm; but, like a good Christian, he recollected that a long train proceeds from pride, and pride from the devil. He is chiefly scandalized at observing nuns and other religious persons followed by trainbearers. Nor is he less offended with the "muzzled faces" of the ladies. The queen is the only female whom he proposes to exempt from the necessity of shewing her face and curtailing her gown. Kitteis Confession, another of his satirical poems, contains many happy strokes of humour. It is directed against auricular confession, a copious source of priestly influence; and the practice is exposed with equal pungency and good sense. The damsel remarks that her ghostly instructor gave her no injunctions to lead a holy life, and to confide in the merits of Christ, but only to follow certain external observances, of which she ventures to doubt the efficacy:

> Bot gave me pennance ilk ane day,
> And Ave Marie for to say,
> And frydayis fyve na fische to eit—
> Bot butter and eggis ar better meit;
> And with ane plak to by ane messe
> Fra drunkin Schir Jhone Latynlesse.

The sanctified lasciviousness of the father confessor is depicted with no unskilful pencil. But the impurities of the Romish church were exposed to a more formidable attack, in "The Testament and Complaynt of our Soverane Lordis Papingo;" a singular performance, in which he admonishes the king and his courtiers, and exposes the corrupt doctrines and vicious lives of the clergy. "In the course of the poem before us," says Mr Warton, "an allegory on the corruptions of the church is introduced, not destitute of invention, humour, and elegance; but founded on one of the weak theories of Wickliffe, who, not considering religion as reduced to a civil establishment, and because Christ and his apostles were poor, imagined that secular possessions were inconsistent with the simplicity of the gospel."[3] But if we recollect what precious fruits both Wycliffe and Lindsay had seen produced by this civil establishment of religion, it is by no means wonderful that they should have adopted such a theory. The clergy enjoyed a very large proportion of the wealth of both kingdoms, and they doubtless exhibited different degrees of piety and learning; but it cannot be denied that their profligacy bore some proportion to their opulence, and that true and vital religion, that religion which affects the heart and influences the conduct, was in a great measure supplanted by idle and unavailing ceremonies. In the Tragedie of the Cardinall, this zealous reformer still prosecutes the same design. The plan of the poem bears some resemblance to that which was afterwards adopted in the Myrrour for Magistrates. As the author, after the hour of prime, is sitting in his oratory and reading the work of Boccaccio *De Casibus Virorum illustrium*, he suddenly perceives the figure of a wounded man, with pale visage and deadly cheer. This visitor, who proves to be the ghost of Cardinal Beaton, entreats him to commit his tragic story to writing; and on his assenting to this proposal, the woe-begone cardinal begins a relation of the principal events of his wicked life; but the story is not told with much elegance or energy.

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[1] Gray, Oratio de illustribus Scotiæ Scriptoribus, p. xxxi.

[2] Dialogvs, eller en Samtale imellom Forfarenhed oc en Hofftienere, om Verdens elendige Væsen, oc begribis vdi fire Böger om Monarchier: fordum screffuen paa Skotske, aff velbyrdige Herre Herr Dauid Lyndsay, Ridder de Monte, etc. oc nu nylige transfererit aff Skotske Maal paa Latine ved Anders Robertson, födt i Aberdijn i Skotland, oc siden aff Latine paa Danske Rijm ved Jacob Mattssön Kiöbenhaffn, o. s. v. Prentit i Kiöbenhaffn, 1591, 4to.—This very curious volume includes a translation of the Monarchie, the Dreme, the Complaynt, the Testament and Complaynt of the Papingo, the Tragedie of the Cardinall, and the Deploratioun of Quene Magdalene. Robertson has prefixed a preface, which is chiefly derived from that of Charteris; and he has adopted the Scotish printer's Adhortatioun, with some slight adaptations to the Danish public. From the peculiar process followed in this translation, we can scarcely expect it to be uniformly correct. Charteris, in his preface, mentions the execution of "the vicar of Dolour, Freir Kelour," and others. Friar Kelour was no doubt translated by Robertson *Frater* Kelour; Mattssön has translated it "hans Broder Kelour," and thus we have the vicar of Dollar and his brother. Andrew Robertson was a native of Aberdeen, and prosecuted his studies in the university of Copenhagen. He is the author of some Latin poems, which have escaped the notice of Nyerup. (Almendeligt Litteraturlexicon for Danmark, Norge, og Island, S. 499.) The name of Jacob Mattssön or Madsen occurs in the history of Danish poetry written by Nyerup and Rahbek. (Bidrag til den Danske Digtekunsts Historie, Bind ii. S. 88. Kiöbenhavn, 1800–19, 5 Bind. 8vo.)

[3] Warton's History of English Poetry, vol. iii. p. 149.

Lindsay has evinced his humour and good sense in ridiculing practices of another kind. One of the most barbarous usages connected with chivalry was the exhibition of tournaments, in which it frequently happened that the valiant knights displayed their courage and address at the expense of their lives; and the ladies of the middle ages attended these spectacles with nearly as little compunction as the ladies of the present age attend the representation of a tragedy at Drury Lane. It was however during the decline of chivalry that Lindsay produced his facetious account of "The Justing betwix Watsoun and Barbour." He represents this justing to have taken place at St Andrews between two gentlemen of the king's household: they are both described as adepts in physic; and as envy is apt to arise among those who follow the same calling, the subject of the poem was probably suggested by the feuds and jealousies which subsisted between these gentle leeches.

One of the author's most entertaining works is the Historie of Squyer Meldrum, which is to be considered as a tale of chivalry, although the champion and the poet flourished at the same period. Lindsay professes to have derived some part of his information from the hero of his story; and the romantic adventures of William Meldrum were yet fresh in the recollection of his countrymen. By assimilating him to the heroes of classical antiquity and of more recent romance, he has imparted to his work a certain air of fiction. With the romantic he has occasionally blended a sufficient mixture of the ludicrous. It is nevertheless to be presumed that much of his narrative is substantially true; and some parts of it can be verified from other authorities. After the exploits of his youth, the heroic squire fixed his residence in Fife, where he possessed an estate, and was appointed the deputy of Patrick Lord Lindsay, sheriff of that county. Here he is said to have administered justice in an exemplary manner, and to have dispensed physic as well as law to the poor. The desperate wounds which he himself had received directed his attention to the healing art; and as ardour was the essence of his character, he seems to have engaged in this new pursuit with his wonted enthusiasm. It is therefore evident that the squire was a person of a very singular character, and his exploits have furnished his friend, the knight of the Mount, with materials for a long and entertaining poem. In the course of his adventures, Meldrum arrives at a castle in Stratherne, and falls in love with its beautifull owner, a young widow, who had been married to his own relation, apparently a cousin. Being conducted to his bedchamber, he continues to meditate on her charms, and at length begins to vent his passion in loud ejaculations: from her own apartment the lady overhears this soliloquy of her heroic guest, and speedily arrives at the conclusion that such ardent love ought to be duly requited. We learn from Lindsay of Pitscottie that she bore him two children, and their marriage was only deferred till they should obtain a dispensation from the pope; for her deceased husband was related to the squire within the prohibited degrees.[1] It does not however appear that the dispensation was ever obtained; and in the mean time "a gentleman called Luke Stirling, envied this love and marriage betwixt thir two persons, thinking to have the gentlewoman to himself in marriage, because he knew the laird might not have the pope's licence by the laws: therefore he solisted his brother's son, the laird of Keir, with a certain company of armed men, to set upon the laird of Binns, to take this lady from him by way of deed; and, to that effect, followed him betwixt Leith and Edinburgh, and set on him beneath the Rood chapel with fifty armed men; and he again defended him with five in number, and fought cruelly with them, and slew the laird of Keir's principal servant before his face, defending himself, and hurt the laird, that he was in peril of his life, and twenty-six of his men hurt and slain; yet, through multiplication of his enemies, he was overset and driven to the earth, and left lying for dead, hought of his legs, and stricken through the body, and the knops of his elbows stricken from him. Yet, by the mighty power of God, he escaped the death, and all his men that were with him, and lived fifty years thereafter."[2]

But the most remarkable of Lindsay's productions still remains unnoticed; namely, his "Satyre of the thrie Estaits, in commendation of vertew and vituperation of vyce." Of the genuine Scottish drama this is the earliest specimen that is now to be found. It does not appear that he was the author of any other work of this description, though it is probable that the same play was somewhat modified for different representations. This play is said to have been acted at Cupar in the year 1535; and it appears to have been acted before the king and his court at Linlithgow in the year 1539. It was likewise "playit beside Edinburgh, in presence of the quene regent and ane greit part of the nobilitie, with ane exceiding greit nowmer of pepill, lestand fra nyne houris afoir none, till six houris at euin." Spectators who retain their places for the space of nine hours, must certainly meet with no slight degree of entertainment; but it appears from one of the stage-directions that the play was divided into two parts, and that they had thus an opportunity of taking some refreshment during a short pause in the representation. Lindsay's Satyre of the thrie Estaits is a morality, containing a mixture of real and allegorical characters, and cannot therefore be expected to exhibit a succession of very probable incidents. It however exhibits some curious germs of the dramatic art; and in reference to those to whom it was originally addressed, it must be regarded as a powerful satire. The principal burden of his satire falls upon the ecclesiastics. It contains an extraordinary mixture of piety and obscenity; and without approaching to the model of a regular drama, it furnishes many unequivocal proofs of the author's ingenuity. As a dramatic composition, it is not necessary to specify its defects, which are indeed sufficiently obvious: Lindsay must however be compared, not with the poets of a later age, but with those of his own; the contemporary history of English poetry presents to us no dramatic work equal to the Satyre of the thrie Estaits. Of this play there is an appendage, apparently written by the same author, which yet remains to be noticed: it is entitled the "Proclamatioun of the Play, maid be Dauid Lindsay." This proclamation is itself a dramatic entertainment, consisting of a few pages, and intended to announce that the play was to be acted on the castle-hill of Cupar on a particular day. Newspapers and play-bills were not then invented; and this was evidently a device for collecting a crowd of people on the market-day, in order to disperse the intelligence.

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[1] In the civil law there were various fluctuations with respect to the marriages of cousins-german; and the reader, who is desirous of prosecuting such researches, will find ample information in the dissertation of Gothofredus, De Nuptiis Consobrinorum, subjoined to his edition of Philostorgii Historia Ecclesiastica, Genevæ, 1643, 4to, and in Otto's Dissertationes Juris Publici et Privati, p. 79. Traj. ad Rhen. 1723, 4to. The law of Justinian stood thus: "Duorum autem fratrum vel sororum liberi, vel fratris et sororis, jungi possunt." (Inst. lib. i. tit. 10. § 4.) The canon law has adopted a different doctrine: prohibitions introduce the necessity of dispensations; dispensations increase the influence and the emoluments of the church. It even prohibits the marriage of third-cousins; and, as we have seen in the case of Squire Meldrum, extends its rule to affinity as well as consanguinity. To this discrepancy between the civil and the canon law, as Dr Wood has suggested, we may trace the origin of a vulgar notion, still prevalent in this kingdom, that first-cousins may marry, but second-cousins may not. (Institute of the Civil Law, p. 47.) In computing the degrees of consanguinity in the transverse line, the civil and the canon law follow very different methods. The rule of the civil law is, that there are as many degrees as persons, exclusively of the common stock; that of the canon law, that degrees of consanguinity are to be reckoned by the number of descents in one line; and where the lines are unequal, the canonist takes the longer of the two. The canon law prohibits marriages in the fourth, the civil law permits them in the same degree; or, in other words, the one law prohibits the marriages of third-cousins, and the other permits the marriages of first-cousins. It may not be superfluous to mention that the earlier canonists differed from each other in one point: "Alii namque patrem in primo gradu, filios in secundo ponunt. Alii primum gradum filios appellant." (Decretum, p. 2. c. 35. qu. 2 & 3. § 21.) But the decision of pope Alexander the Second, that two degrees in the civil law make one in the canon law, has been generally adopted by later writers. "Qui tamen parens," says Canisius, "gradum non efficit, sed ipsius filius et filia primum gradum constituunt; et ex his filius et filia secundum gradum." (Summa Juris Canonici, lib. ii. tit. xii. § 9.) This decision is however overlooked by Dr Taylor, who describes first-cousins as standing in the third degree of consanguinity, according to the computation of the canon law. (Elements of the Civil Law, p. 331.)

[2] Lindsay's Hist. of Scotland, p. 129. Edinb. 1728, fol.—This fair lady was "called the Lady Gleneagies, who was daughter to Mr. Richard Lawson of Humby, provost of Edinburgh; the which lady had born to this laird two bairns, and [he] intended to marry her, if he might have had the pope's licence, because her husband before and he were sib."

Sir David Lindsay has now maintained his popularity for the space of three hundred years, and his works have been printed in a great variety of forms. The last edition, which makes very extraordinary pretensions to general erudition and to particular accuracy, was published by Mr George Chalmers. Lond. 1806, 3 vols. 8vo. The editor displays a modesty of disposition and an elegance of taste, which are only surpassed by the suavity of his manner and the profundity of his learning. All these topics might afford scope for illustration, but we shall at present confine ourselves to the subject of his erudition, which has been highly extolled by writers nearly as learned as himself. The following line occurs in Ketteis Confession.

Thocht Codrus kyte suld cleue and birst.

"I know not," says the accomplished editor, "if there be any allusion here to either of the Codruses, who are feigned by poets: Lindsay may have alluded to Urceus Codrus, an Italian professor, and poet, of a singular character, who died, in 1500." Vol. ii. p. 214. But if his classical studies had ever proceeded so far as the seventh eclogue of Virgil, he would have had no difficulty in discovering to which "of the Codruses" the poet alludes.

Pastores, hedera crescentem ornate poetam,
Arcades, invidia rumpantur ut ilia Codro.

In vol. i. p. 81. we find the subsequent remarks: "Cocburn's *Meditatio* was printed at St Andrews, by Jhone Scot, in 1555. He calls himself Johannis Scot, in the titlepage, and Johannes Scott, in the colophon." This change from *Johannis* to *Johannes* we can undertake to explain: the title bears "ex typographia Johannis Scot," and the colophon, "excudebat Joannes Scott." The numerous works of this writer betray such a radical ignorance of the Latin language, that we have no doubt of his intending to express his surprise at the variation of the genitive from the nominative case. In another publication, he enumerates "Cicero's Epistles de Senectute, de Amicitio; Terence's Comedies and Elegies; Ovid's Tristium." After meeting with these specimens of his scholarship, we are sufficiently prepared for his commentary on another passage of Lindsay, which alludes to the pretensions of the pope.

His style at lenth gif thow wald knaw,
Thow moste ga luke the cannon law:
Baith in the Sext and Clementene
His staitlie style thair may be sene.

"The allusion," he is pleased to inform his readers, "is to the Works of Pomponius Sextus, the great jurist of the 3d century." Vol. iii. p. 89. Pomponius did not flourish in the third, but in the second century: if however he had actually written in the third century, how could he have illustrated the temporal power and splendour of the pope, before Christianity was established in the Roman empire? The *Sext* to which Lindsay alludes is "Liber *sextus* Decretalium," a portion of the *Corpus Juris Canonici*. See above, vol. vi. p. 94. A further specimen of this editor's acquaintance with literary and ecclesiastical history occurs in the following passage: "We may infer, that the Calvinists were not yet known, as a sect." Vol. i. p. 425. Certainly we may infer that the Calvinists were utterly unknown as a sect in 1535, inasmuch as Calvin, the founder of that sect, did not become a minister and professor at Geneva till the ensuing year.[1] (x.)

LINDSEY, the third and largest division of the county of Lincoln, in England. On the east and north it is washed by the sea, into which it runs out with a large front; on the west it has Yorkshire and Nottinghamshire, from which it is parted by the rivers Trent and Dun; on the south it has Kestoven, from which it is separated by the river Witham and the Foss-dyke, which is seven miles long, and was cut by Henry I. between the Witham and the Trent, for the convenience of carriage in those parts. It derived its name from Lincoln, the capital of the county, which stands in it, and by the Romans was called *Lindum*, by the Britons *Lindcoite*, by the Saxons *Lindo-collyne*, probably from its situation on a hill, and the lakes or woods that were anciently thereabouts; but the Normans called it *Nichol*.

LINDUS, in *Ancient Geography*, a town of Rhodes, situated on a hill on the western side of the island. It was built by Tlepolemus the son of Hercules, according to Diodorus Siculus; but by one of the Heliades, grandsons of the Sun, named *Lindus*, according to Strabo. It was the native place of Cleobulus, one of the wise men. Here was the famous temple of the Lindian Minerva, built by the daughters of Danaus. Cadmus enriched this temple with many splendid offerings. The citizens dedicated and hung up here the seventh of Pindar's Olympic odes, written in letters of gold. The ruins of that superb edifice are still to be seen upon the top of a high hill which overlooks the sea. Some remains of the walls, consisting of stones of an enormous size, still show that it had been built in the Cyclopian style.

Lindo, the modern city, stands at the foot of the hill. A bay of considerable wideness and depth serves as a harbour to the city. Ships find good anchorage there in twenty fathoms water. They are safely sheltered from the south-west winds, which constantly prevail during the severe season of the year. In the beginning of winter, they cast anchor off a small village named Massary. Before the building of Rhodes, Lindus was the harbour which received the fleets of Egypt and of Tyre; and it was enriched by commerce. Mr Savary observes, that a judicious government, by taking advantage of its harbour and happy situation, might yet restore it to a flourishing state.

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[1] Bayle, Dictionaire Historique et Critique, tom. i. p. 729.

LINE, in *Geometry*, a quantity extended in length only, without breadth or thickness. It is formed by the flux or motion of a point.

LINE, in the art of war, is understood of the disposition of an army ranged in order of battle, with the front extended out, so that it may not be flanked.

LINE of Battle, is also understood of the disposition of a fleet in the day of engagement; on which occasion the vessels are usually drawn up as much as possible in a straight line, as well to gain and keep the advantage of the wind, as to run the same board. See NAVAL TACTICS.

Horizontal LINE, in *Geography* and *Astronomy*, a line drawn parallel to the horizon of any part of the earth.

Equinoctial LINE, in *Geography*, is a great circle on the earth's surface, exactly at the distance of 90° from each of the poles, and of consequence bisecting the earth in that part. From this imaginary line, the degrees of longitude and latitude are reckoned. In astronomy, the equinoctial line is that circle which the sun seems to describe round the earth on the days of the equinox in March and September.

Meridian LINE, is an imaginary circle drawn through the two poles of the earth and any part of its surface.

Ship of the LINE, a vessel large enough to be drawn up in the line of battle, and to have a place in a sea-fight.

LINE, in *Genealogy*, a series or succession of relations in various degrees, all descending from the same common father.

LINES, in *Heraldry*, the figures used in armories to divide the shield into different parts, and to compose different figures. These lines, according to their different forms and names, give denomination to the pieces or figures which they form, except the straight or plain lines.

LINEAMENT, amongst painters, is used for the outlines of a face.

LINEAR NUMBERS, in *Mathematics*, such as have relation to length only; like a number which represents one side of a plain figure. If the plain figure be a square, the linear figure is called a *root*.

LINEAR Problem, that which may be solved geometrically by the intersection of two right lines. This is called a *simple problem*, and is capable of but one solution.

LINEN (in German, *linnen*, *leinwand*), a species of cloth usually made of thread of flax, but sometimes also of hemp. Linen seems to have been known and manufactured in Egypt from the earliest times, and used, if not as an article of ordinary dress, at least in swathing the bodies of the dead. But it was not worn by the Jews, the Greeks, or the Romans, under tunics of a finer texture having amongst them supplied the place of shirts; and hence the necessity of frequent bathing. Alexander Severus was the first Roman emperor who wore linen; but the use of this necessary article did not become common until long after his time.

The manufacture of this commodity has been prosecuted in England for a very long period, probably since the time of the Romans; but though its progress has been considerable, particularly within the last twenty or thirty years, it has not been so great as might have been anticipated. This is no doubt to be ascribed partly to the efforts which have been made to encourage and bolster up the manufacture in Ireland and Scotland, and partly to the rapid growth of the cotton manufacture, the fabrics of which have to a considerable extent supplanted those of linen.

In 1698, both houses of parliament addressed the king, William III., representing that the progress of the woollen manufacture of Ireland was such as to prejudice that of England, and that it would be for the public advantage were the former discouraged, and the linen manufacture established in its stead. His majesty replied that he would do all that in him lay to *discourage* the *woollen* manufacture in Ireland, to encourage the *linen* manufacture, and to promote the trade of England. Nothing can be more strikingly characteristic of the erroneous and illiberal notions which were then entertained respecting the plainest principles of public economy, than this address, and the answer made to it by the sovereign. But whatever the people of Ireland might think of the king of England deliberately avowing his determination to do all in his power to crush a manufacture in which they had made considerable progress, government had no difficulty in prevailing upon the legislature of that country to second their views, by prohibiting the exportation of all woollen goods from Ireland, except to England, where prohibitory duties were already imposed on the importation of such goods. The parliament and government of England, however, though anxious to protect the woollen manufacture of that country, never discovered any backwardness to promote the linen trade of Ireland; and ever since the reign of William III. it has been the object of regulation and encouragement. It may indeed be doubted whether the regulations in question have always been the most judicious that might have been devised, and whether Ireland has really been benefited by the forced extension of the linen manufacture. Mr Young and Mr Wakefield both contend that the extension of the linen manufacture has not been advantageous to that country; and it seems to be sufficiently established, that though the manufacture might not have been so widely diffused, it would have been in a sounder and more healthy state had it been less the subject of legislative interference.

Besides premiums and encouragements of various kinds, bounties were granted on the exportation of linen from an early period down to the year 1830. In 1829, for instance, notwithstanding the bounty had then been very much reduced, it amounted to about L.300,000, or nearly one-seventh of the declared value of the linen exported in that year. It would be difficult to imagine a greater abuse than this. Such a bounty, instead of promoting the manufacture, rendered those engaged in it comparatively indifferent to improvements; and, though it had been otherwise, the policy of persisting, during more than a century, in supplying foreigners with linens for less than they cost, cannot possibly be defended. There is no reason to doubt, that were the various sums expended in well-meant but useless attempts to force this manufacture, added together with their accumulations at simple interest, they would be found sufficient to yield an annual revenue little if at all inferior to the entire value of the linens which we now send abroad. In fact, the business never began to do any real good, or to take firm root, until this manufacture ceased to be a domestic one, and was carried on principally in mills, and by the aid of machinery; a change which the forcing system, so long pursued, tended to counteract. The only real and effective legislative encouragement which the manufacture has ever met with, has been the reduction of the duties upon flax and hemp, and the relinquishment of the absurd attempts made to force the growth of these raw commodities at home.

The following table, which it is to be regretted the parliamentary accounts do not furnish the means of continuing to the present day, exhibits an account of the quality and value of the linens exported from Ireland, during a period of nearly thirty years, from 1800 to 1829 both inclusive.

Years.	To Great Britain.	To Foreign Parts.	Total.	Amount of Bounty paid in Ireland on Linen exported to Foreign Parts.		
	Yards.	Yards.		£	s.	d.
1800	31,978,039	2,585,829	34,563,868	~~~	~	~
1802	33,246,943	2,368,911	35,615,854	~~~	~	~
1804	39,837,101	3,303,528	43,140,629	10,545	2	2
1806	35,245,280	3,880,961	39,126,241	15,668	4	6
1808	41,958,719	2,033,367	43,992,086	6,740	16	0
1810	32,584,545	4,313,725	36,898,270	16,448	19	9
1812	33,320,767	2,524,686	35,845,453	11,548	3	4
1814	39,539,443	3,463,783	43,003,226	17,231	14	11
1815	37,986,359	5,496,206	43,482,565	17,430	17	3
1816	42,330,118	3,399,511	45,729,629	12,082	6	4
1817	50,288,842	5,941,733	56,230,575	21,524	15	4½
1818	44,746,354	6,178,954	50,925,308	28,848	6	2
1819	34,957,396	2,683,855	37,641,251	16,177	8	3½
1820	40,318,270	3,294,948	43,613,218	11,928	9	11
1821	45,519,509	4,011,630	49,531,139	18,218	19	2¾
1822	43,226,710	3,374,993	46,601,703	17,112	9	2
1823	48,066,591	3,196,006	51,235,597	17,765	5	10
1824	46,466,950	3,026,427	49,493,377	17,114	13	10½
1825	52,559,678	2,553,587	55,113,265	12,015	9	6½
1826	The exportations to Great Britain cannot be ascertained for these years, the cross-channel trade having been assimilated by law to a coasting traffic.	2,726,297	....	10,249	17	9
1827		4,284,566	....	12,114	0	8
1828		3,214,911	....	9,494	7	5
1829		2,386,223	....	6,886	1	11

Of these exports more than twelve-thirteenths have been to Great Britain. The total average exportation during the three years ending with 1825, was 51,947,413 yards, of which 49,031,073 were sent to this country; the exports to all other parts being only 2,916,340 yards. Since 1825, the trade between Ireland and Great Britain has been placed on the footing of a coasting trade, so that linens are now exported and imported without any specific entry at the Custom-house.

In 1727, a board of trustees was established in Scotland for the superintendence and improvement of the linen manufacture. It is not probable that the institution of this board could of itself have been of any material service; but considerable bounties and premiums being at the same time given on the production and exportation of linen, the manufacture went on increasing. Still it did not increase as fast as cotton and some others, which received no adventitious support, until machinery began to be extensively employed in the manufacture; and hence it is doubtful whether the influence of the bounty has been as great as it might at first view appear to have been. The regulations as to the manufacture, after having been long objected to by those concerned in it, were abolished in 1822; and the bounties have in like manner ceased.

Dundee is the principal seat of the Scottish linen manufacture, and its progress there has latterly been extraordinary. The manufacture appears to have been introduced into Dundee about the beginning of the last century; but for a long period its progress was comparatively slow. In the year 1745, the quantity of flax imported amounted only to seventy-four tons, without any hemp; and the shipments of linen cloth, during the same year, were estimated at about 1,000,000 yards; but no mention is made either of sail-cloth or of bagging. In 1791, the imports of flax amounted to 2444 tons, and those of hemp to 299 tons; whilst the exports of that year were 7,842,000 yards of linen, 280,000 yards of sail-cloth, and 65,000 yards of bagging. From this period the trade began to extend itself gradually. Previously to the peace of 1815, no great quantity of machinery had been employed in spinning; but about this period, the trade began to increase rapidly, partly in consequence of the improvement of the machinery, and its extensive employment in the manufacture, and partly also from the greater regularity with which supplies of raw material were obtained from the northern powers. Indeed its progress has been quite astonishing; the imports of flax having risen from 3000 tons in 1814, to 15,000 tons in 1830. The exports of manufactured goods have increased in a corresponding ratio. During the year ending on the 31st of May 1831, there were imported into Dundee 15,010 tons of flax, and 3082 of hemp; and there were shipped off 366,817 pieces, being about 50,000,000 yards, of linen; 85,522 pieces, or about 3,500,000 yards, of sail-cloth; and about 4,000,000 yards of bagging; making a total of about 57,500,000 yards. In the year ending on the 31st of May 1833, the imports of flax amounted to 18,777 tons, besides 3380 tons of hemp. The shipments of linen, sail-cloth, and bagging, increased in a corresponding ratio, and were this year valued at L.1,600,000.

It appears, therefore, that the shipments of linen from this single port are as great as those from all Ireland; and whilst the manufacture has been tardily progressive in the latter, it has advanced in Dundee with even greater rapidity than the cotton manufacture at Manchester. It is not easy to account, in a satisfactory manner, for this wonderful advancement. Something must be ascribed to the convenient situation of the port for obtaining supplies of the raw material from the north of Europe; and more, perhaps, to the manufacture having been long established in the towns and villages of Strathmore, the Carse of Gowrie, and the northern parts of Fife, of which Dundee is the emporium. But these circumstances do not seem adequate to explain the pre-eminence which this place has recently attained in the linen manufacture; a superiority which must, we think, be ascribed, partly to a concurrence of fortunate accidents, and partly to the increased skill, enterprise, and capital of the manufacturers. From whatever causes this pre-eminence may have in the first instance arisen, it is obvious, however, that, having once been attained by any place like Dundee, it must be exceedingly difficult for others to come into competition with its manufacturers, who have on their side established connections, workmen of superior skill and dexterity, improved machinery, and constantly accumulating capital. Recently, indeed, the advantages possessed by old establishments have, to a considerable extent, been neutralised by the prevalence of combinations amongst the workmen; but it is to be hoped that means will speedily be devised for obviating this formidable, and, we fear, growing evil.

The following Table exhibits the quantity of British and Irish Linen Cloth, of all sorts, separately exported from England, Scotland, and Ireland, during the Year 1830; *specifying the quantities sent from each to the Countries importing the same, with their real or declared Values, and the Bounty paid on Exportation.*

Countries to which Exported.	ENGLAND.		SCOTLAND.		IRELAND.[1]	UNITED KINGDOM.	
	British Linen.	Irish Linen.	British Linen.	Irish Linen.	Irish Linen.	Total Exports. British and Irish Linen.	Total declared value of Exports.
	Yards.	Yards.	Yards.	Yards.	Yards.	Yards.	
EUROPE.							
Russia	5,646	...	806	...	...	6,452	L.330 4 3
Sweden	140	...	...	...	...	140	8 15 0
Norway	11,023	...	6,408	...	402	17,833	813 15 1
Denmark	2,184	160	...	...	...	2,344	139 0 0
Germany	70,254	78	8,123	...	...	78,445	3,928 12 1
Netherlands	71,218	618	3,378	...	...	75,214	4,064 2 3
France	102,793	200	...	...	...	102,993	11,138 14 0
Portugal, Azores, &c	772,472	102,645	234,702	...	30,687	1,140,506	36,003 11 10
Spain and the Canaries	4,710,059	217,762	37,977	13,000	...	4,979,098	143,444 9 10
Gibraltar	1,212,133	57,229	102,049	554	...	1,371,965	42,181 6 5
Italy	277,904	15,919	...	...	1,500	295,323	24,241 6 10
Malta	80,155	14,014	3,360	...	...	97,529	4,289 19 2
Ionian Islands	14,828	680	...	...	...	15,508	1,024 2 9
Turkey	40,550	5,112	...	...	...	45,662	2,856 6 0
Guernsey, Jersey, &c	234,993	11,994	2,715	...	3,322	253,024	14,663 12 0
	7,606,352	426,411	399,518	13,854	35,911	8,482,046	L.289,097 17 6
ASIA	474,794	20,810	124,713	239	950	621,506	29,240 8 1
AFRICA	653,419	7,120	2,430	...	...	662,970	24,534 11 6
AMERICA.							
British North Colonies	574,783	95,365	1,366,133	43,215	135,613	2,215,099	81,959 11 1
British West Indies	5,068,741	815,953	3,295,327	180,850	1,076,038	10,436,909	322,837 9 7
Foreign West Indies	2,722,604	631,746	2,632,825	56,349	...	6,032,669	152,930 8 10
United States	4,160,052	4,463,685	10,668,224	28,406	1,314,409	20,634,776	698,787 18 5
Brazil	3,722,604	1,059,816	1,221,418	11,128	79,346	6,094,312	178,317 11 8
Mexico	1,527,753	1,946,110	...	...	...	3,473,863	134,814 2 0
Colombia	843,052	2,230	516,209	2,031	...	1,366,522	33,525 5 10
Peru	293,247	467,998	...	...	...	761,245	31,865 0 0
Chili	85,744	78,653	...	...	...	164,397	7,970 4 6
Rio de la Plata	407,361	233,100	275,559	57,620	...	973,640	31,893 0 1
Total	28,129,651	10,248,997	20,505,356	393,692	2,642,267	61,919,963	L.2,017,775 11 10[2]
Number of yards of linen upon which bounty was paid in the year ending 5th January 1831	25,133,749	7,849,987	20,392,010	315,992	1,921,870	55,613,508	
Amount of bounty paid thereon	L.69,878 1 5¼	L.23,146 7 11½	L.53,503 18 8	L.952 14 3	L.628 19 2	L.153,110 1 5¾	

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[1] No British linen sent from Ireland.

[2] The declared value of the linens exported in 1831 was L.2,461,704.

There are no data sufficient to enable us to form an accurate estimate of the entire value of the linen manufacture of Great Britain. Colquhoun estimated it at L.15,000,000; but there cannot be a doubt that this is a great exaggeration. Sir F. M. Eden estimated the entire value of the linen manufacture of Great Britain, in 1800, at L.2,000,000; and if we assume that since that period the manufacture has been tripled in value, we shall not probably be far from the truth. Professor M'Culloch thinks that the entire produce of the manufacture in the united kingdom does not exceed L.7,500,000; but some very intelligent individuals, largely engaged in the trade, do not estimate it at so much; and, at all events, we may feel confident that this sum, if it err not in excess, is certainly by no means within the mark. If, then, we set aside a third part of this sum for the value of the raw material, and twenty-five per cent. for profits, wages of superintendence, wear and tear of fixed capital, coals, and other charges, there will remain L.3,125,000 to be divided as wages amongst those engaged in the manufacture; and, supposing every individual to earn at an average L.18 a year, the total number employed in it would be about 172,000. It may, perhaps, be thought that L.18 is too low an estimate for wages, and such would, no doubt, be the case, if Ireland were not taken into the average; but as a great many persons are there employed at very low wages, it may be inferred that L.18 is not very far from the mean rate, more especially as a vast number of persons in Ireland are only partly employed in the manufacture, whereas by this estimate it is supposed that 172,000 individuals are wholly employed in it.

It appears from official statements, which it is unnecessary to give in detail, that in 1830 the aggregate amount of the importations into the united kingdom, from various countries, of undressed hemp, flax, and tow or codilla, of hemp and flax dressed or undressed, and linen yarn, is, of the first, 506,771 cwt., of the second 944,096 cwt., and of the third, 19,211; the official value thereof being respectively, for Great Britain, L.411,832, L.1,923,428, and L.104,559, and for Ireland, L.15,926, L.18,803, and L.19,623. The official value of exports, ranged under the same heads, is, respectively, L.11,798, L.7720, and of linen yarn *nil;* so that the official value of hemp, flax, and linen yarn, left for consumption in the united kingdom, in 1830, was L.415,960, L.1,934,511, and L.124,182. From other accounts, it further appears that the consumption of foreign linens in this country is inconsiderable; in fact, the real or declared value of those entered for home consumption, in 1830, could scarcely exceed L.20,000.

The regulations as to the linen manufacture may be shortly stated. They are as follow: *1st,* Any person, native or foreigner, may, without paying any thing, set up in any place, privileged or not privileged, corporate or not corporate, any branch of the linen manufacture; and foreigners, practising the same, on taking the oath of allegiance, &c. become entitled to all the privileges of natural-born subjects. *2d,* Persons affixing stamps to foreign linens, in imitation of the stamps affixed to those of Scotland or Ireland, forfeit L.5 for each offence; and persons exposing to sale or packing up any foreign linens as the manufacture of Great Britain or Ireland, forfeit the same, besides L.5 for each piece of linen so exposed to sale or packed up. *3d,* Any person stealing, to the value of L.10, any linen, woollen, silk, or cotton goods, whilst exposed during any stage of the manufacture, in any building, field, or other place, shall, upon conviction, be liable, at the discretion of the court, to be transported beyond seas for life, or for any term not less than seven years, or to be imprisoned for any term not exceeding four years; and, if a male, to be once, twice, or thrice, publicly or privately whipped, as the court shall think fit. These regulations are founded on 15 Charles II. c. 15; 17 Geo. II. c. 30; and 7 and 8 Geo. IV. c. 49, § 14. (See M'Culloch's *Dictionary of Commerce,* art. LINEN.) (A.)

Fossil LINEN, is a kind of amianthus, which consists of soft, flexible, parallel fibres, and has been celebrated for the use to which it has been applied, of being woven, and forming an *incombustible cloth.* Paper and wicks for lamps have also been made of it.

LINGEN, a city of the province of Osnaburg, in the kingdom of Hanover, the capital of a bailiwick of the same name. It is situated on the river Ems, which is only navigable thereto for a few months in the year. It is surrounded with ditches, contains a Catholic, a Reformed, and a Lutheran church, 380 houses, and 1930 inhabitants. There is a seminary, sometimes called a university, with five professors. It has some manufactures of woollen goods. Long. 7. 12. 16. E. Lat. 52. 31. 41. N.

LINKOPING, a province in the south of Sweden, which extends in north latitude from 57. 41. to 59. 1., and in east longitude from 14. 26. to 17. 1., including 4510 square miles. It is a most picturesque country, covered with mountains, hills, lakes, rivers, and forests, but inhabited by only 165,000 inhabitants, in five cities or towns, and 5489 detached settlements. The chief employment is cutlery, sawing wood, and extracting some copper and iron from the mines. The capital is a city of the same name, situated on the Stang An, over which there is a well-constructed stone bridge. It is the seat of a bishop, and has a respectable cathedral, and two other churches; a gymnasium, with a good library and collections of natural history and medals; with 550 houses, and 2995 inhabitants, who carry on some trade in tanning and in linen weaving. Long. 15. 27. 48. E. Lat. 58. 22. 28. N.

LINLITHGOW, the capital of the county of that name, and once a place of some importance, is pleasantly situated on the bank of a fine lake, sixteen miles west from Edinburgh, and thirty-one east from Glasgow. It consists chiefly of a single street, running east and west along the south bank of the lake, containing many substantial though old houses; and is gradually improving in appearance, in consequence of the increasing number of modern buildings. The name Linlithgow is supposed by some to signify the *concavity of the Lin or Loch,* and according to others the lake of the sheltered valley. It is a very ancient town, having been the residence of royalty, and hence was entitled to be called a king's burgh in the twelfth century. It possesses an old palace or castle built by David I., which was destroyed by fire in 1745, and has not since been repaired. It has also a very ancient church, built in the Gothic style, ornamented with a spire of some height; and three dissenting meeting-houses. Though the town is very dull in appearance, the inhabitants are by no means inactive. The tanning of leather, for which the adjoining lake affords great convenience, is carried on to a considerable extent; as also the craft of shoemaking. Linen and woollen manufactures are pretty extensive, and there is a large calico-printing establishment about a mile from the town. It receives great advantage from the Union Canal, which passes in the immediate vicinity, for transporting goods to the capital. There is a weekly stock market held on Friday. The population in 1831 amounted to 4874.

LINLITHGOWSHIRE, or WEST-LOTHIAN, a county in Scotland, having the Frith of Forth on the north, Edinburghshire or Mid-Lothian on the east and south-east, Lanarkshire on the south-west, and Stirlingshire on the west, is situated between 55. 49. and 56. 1. north latitude, and 3. 18. and 3. 51. west longitude from Greenwich. It is of a triangular form, about nineteen miles long on its eastern boundary, and thirteen on its western; but at a medium it is only about seven miles broad and sixteen long, and its area is therefore 112 square miles, or 71,680 English acres; though, according to some surveys, the superficial contents of the whole is 121 square miles, or 77,440 statute acres.

So large a portion of the surface of this county is either level or gently undulating, that only a fifth part of it is stated to be unfit for cultivation. Yet a considerable space is occupied by hills. A ridge extends across it from north-west to south-east, of which Cairnpapple, the most elevated point, is about 1500 feet high. The highest ground is in the middle, and towards the west; on the south there is much moor and moss; but the hills for the most part yield good pasturage, and some of them are planted. The climate, though variable, is not severe. The prevailing winds are from the south-west, which blow for about two thirds of the year. According to a register of the weather, kept at Duddingston on the coast of the frith, about the middle of the northern boundary, the greatest number of rainy and snowy days, in any one year, for a period of thirty years, from 1778 to 1808, was 111 (in 1780), and the smallest number 22 (in 1803); but days on which slight showers fell are not included. The greatest heat in that period was in June 1785, when the thermometer stood at 87° in the shade, in a northern exposure. In June 1787, there was a week of frost, with ice one sixteenth of an inch in thickness.

Though there is a great variety of soil in this district, with considerable tracts of gravel and sand, yet clay is the most general. The coldest soil is chiefly on the south and south-western parts, which have also the coldest climate. The following estimate will show the quantity of the different kinds of soil found in the county:—Clay of good quality, 20,000 English acres; clay on cold bottom, 24,500; loam 10,000; light gravel and sand, 10,000; moors and high rocky land, 15,220; mosses, 1700; water, 500: total 81,920 English acres.

The only streams of any note are, the Almond, which rises on the border of Lanarkshire, and flows north-east for about twenty-four miles between this county and Edinburghshire; and the Avon, which forms the western boundary for about twelve miles. Both these rivulets fall into the Frith of Forth. On the north side of the town of Linlithgow there is a lake about a mile long and half a mile broad, occupying about 150 acres, which contains pike, perch, and eels; and a smaller one on the south, called Loch Coat, which occupies about twenty-two acres, stocked with the same kinds of fish. In the parishes of Linlithgow, Ecclesmachan, and Abercorn, there are several sulphureous springs; and a strong chalybeate is found in the parish of Torphichen; but none of them are much resorted to.

Silver and lead were at one time got in the hills of Bathgate, in the parish of Linlithgow; and in the neighbourhood a small vein of silver ore was found several years ago in a limestone quarry. Ironstone is wrought occasionally in the parishes of Borrowstownness and Carriden. Sandstone, in some places of an excellent quality, prevails along the coast of the Forth; and in the interior, whinstone, granite, and basalt, are also found; and there is an inexhaustible store of limestone. On Dundas Hill there is a basaltic rock 250 yards in length and about sixty feet in height, with an almost perpendicular front, consisting of a bluish granite of a very fine texture. There is also abundance of potters' clay, brick clay, red chalk, and marl. Shell marl was dragged in considerable quantities from the lake at Linlithgow, as a manure, till the benefits of lime superseded the use of it. But the chief mineral production is coal, which abounds in almost every part of the county, and is wrought in the parishes of Borrowstownness and Carriden on the Forth, in Uphall and Whitburn on the east and south, and in the parish of Bathgate in the middle. An excellent kind of coal has been wrought near Cultmuir, on the south-western border. The Union Canal, which passes through this county, affords excellent means of transporting the coal of the interior to the city of Edinburgh.

Linlithgowshire is for the most part divided into estates worth from L.200 to L.3000 a year; but there are a few above, and several below, these extremes. In the neighbourhood of the burghs of Linlithgow and Queensferry there are properties of only a few acres. Four of the greatest estates, rented at from L.4000 to L.10,000, belong to as many noblemen. The valued rent, taken in 1649, was L.75,027. 12s. 2d. Scots; in 1806, the real rent was L.64,518. 18s. 7d. sterling; and, in 1811, the real rent of the lands and mines was L.82,947. 2s., and of the houses, L.5798. 8s. Almost half the county is entailed. The principal seats are, Hopetoun House, Earl of Hopetoun, two miles west of Queensferry; Barnbougle Castle and Livingston House, Earl of Rosebery; Craigiehall, Mr Hope Vere; Duddingston, Mr Dundas; Hallyards, Mr Ramsay; Houston, Mr Sharp; Kinneil, Duke of Hamilton, near Borrowstownness; and Polkemmet, Mr Baillie.

The size of the farms is from fifty Scotch acres to 600, but the greater part consist of between 100 and 300 English acres. The rent of the better soils, which extend over half the county, varies from L.2 to more than L.5 the acre; that of the inferior clays is from 14s. to 20s., and of the high grounds from 6d. to 10d.; the average rent of the whole, in 1811, being rather more than 23s. the English acre. The common term of leases is nineteen or twenty-one years; but, in some instances, they are for twenty-four, thirty-eight, and even fifty-seven years: grazing farms are let on short leases, from one to four years. The crops raised are the same as in the other counties in this part of Scotland, which have already been described; and the general system of husbandry is not materially different, except that the dairy is more an object here than in the counties to the east and south-east. The county has two royal burghs, Linlithgow and Queensferry, and the towns of Bathgate and Borrowstownness; besides a number of thriving villages. It is divided into fourteen parishes, which, with two in Mid-Lothian, and four in Stirlingshire, form one presbytery. It sends one member to parliament, the constituency, according to the latest census, being 692. The annexed table contains an abstract of the population for 1811, 1821, and 1831.

YEARS.	HOUSES.			OCCUPATIONS.			PERSONS.		
	Inhabited.	By how many Families occupied.	Uninhabited.	Families chiefly employed in Agriculture.	Families chiefly employed in Trade, Manufactures, or Handicraft.	All other Families not comprised in the two preceding classes.	Males.	Females.	Total of Persons.
1811	3098	4404	186	1132	1506	1766	8,874	10,577	19,451
1821	3302	4965	96	1224	1817	1924	10,713	11,982	22,695
1831	3400	5014	205	1093	1891	2030	10,995	12,296	23,291

LINNÆUS, or LINNE, SIR CHARLES, a celebrated botanist and natural historian, was born on the 24th of May 1707, in a village called Roeshult, in Smaland, where his father, Nicholas Linné or Linnæus, was then vicar, but afterwards preferred to the curacy of Stenbrohult. It is said, that on the farm where Linnæus was born there yet stands a large lime tree, from which his ancestors took the surnames of *Tiliander*, *Lindelius*, and *Linnæus;* and that this origin of surnames, taken from natural objects, is not uncommon in Sweden.

This eminent man, whose talents enabled him to reform the whole science of natural history, acquired, early in life, some of the highest honours that await the most successful proficients in medical science. We find indeed that he was made professor of physic and botany in the university of Upsala at the age of thirty-four, and, six years afterwards, physician to Adolphus king of Sweden, who in the year 1753 still further honoured him, by creating him knight of the order of the polar star. Nor did his honours terminate here. In 1757 he was ennobled; and in 1776 the king of Sweden accepted the resignation of his office, and rewarded his declining years by doubling his pension, and by a liberal donation of landed property settled on him and his family.

It seems probable that Linnæus's taste for the study of nature was formed from the example of his father, who, as he has himself informed us, cultivated, as his first amusement, a garden plentifully stored with plants. Young Linnæus soon became acquainted with these, as well as with the indigenous plants of his neighbourhood. Yet, from the smallness of his father's income, the young naturalist was on the point of being destined to a mechanical employment: fortunately, however, this design was overruled. In 1717 he was sent to school at Wexio, where, as his opportunities were enlarged, his progress in all his favourite pursuits was proportionally extended. At this early period he paid attention to other branches of natural history, particularly to the study of entomology.

The first part of his academical education Linnæus received at Lund, in Sweden, under Professor Stobæus, who favoured his inclination for the study of natural history. After a residence of about a year, he removed in 1728 to Upsala. Here he soon contracted a close friendship with Artedi, a native of the province of Angermania, who had already been four years a student in that university, and, like himself, had a strong bent to the study of natural history in general, but particularly to that of ichthyology. Soon after his residence at Upsala, our author was likewise fortunate enough to obtain the favour of several gentlemen of established character in literature. He was in a particular manner encouraged in the pursuit of his studies by the patronage of Dr Olaus Celsius, at that time professor of divinity, and the restorer of natural history in Sweden; who, being struck with the diligence of Linnæus in describing the plants of the garden at Upsala, and his extensive knowledge of their names, not only patronized him in a general way, but admitted him to his house, his table, and his library. Under such encouragement, it is not strange that he made a rapid progress, both in his studies and the esteem of the professors; in fact, we have a very striking proof of his merit and attainments, since we find, that, after a residence of only two years, he was thought sufficiently qualified to give lectures occasionally from the botanic chair, in the room of Professor Rudbeck.

In the year 1731, the Royal Academy of Sciences at Upsala, having for some time meditated the design of improving the natural history of Sweden, at the instance particularly of Professors Celsius and Rudbeck, deputed Linnæus to make the tour of Lapland, with the view of exploring the natural history of that arctic region; an undertaking to which his reputation, already high as a naturalist, and the strength of his constitution, equally recommended him. He left Upsala on the 13th of May, and took his route to Gevalia or Gevels, the principal town of Gestricia, forty-five miles distant from Upsala. From thence he travelled through Helsingland into Medalpadia, where he made an excursion, and ascended a remarkable mountain before he reached Hudwickswald, the chief town of Helsingland. He then proceeded through Angermanland to Hernosand, a sea-port on the Bothnian Gulf, seventy miles distant from Hudwickswald. When he had advanced thus far, he found it proper to retard his journey, as the spring was not sufficiently advanced, and took this opportunity of visiting those remarkable caverns on the summit of Mount Skula, though at the hazard of his life.

When Linnæus arrived at Uma, in West Bothnia, about ninety-six miles from Hernosand, he quitted the public road, and took his course through the woods westward, in order first to traverse the most southern parts of Lapland. Having now reached the country that was more particularly the object of his inquiries, being equally a stranger to the language and to the manners of the people, and without any associate, he committed himself to the hospitality of the inhabitants, and never failed to experience it fully. He speaks in several places, with peculiar satisfaction, of the innocence and simplicity of their lives, and their freedom from diseases. In this excursion he reached the mountains towards Norway; and after encountering great hardships, returned into West Bothnia, quite exhausted with fatigue. He next visited Pitha and Lula, upon the Gulf of Bothnia; from which latter place he again took a western route, by proceeding up the river of that name, and visited the ruins of the temple of Jockmock in Lula Lapland or Lap Mark; he thence traversed what is called the *Lapland Desert*, destitute of all villages, cultivation, roads, or any conveniences, and inhabited only by a few straggling people, originally descended from the Finlanders, who settled in this country in remote ages, being entirely a distinct people from the Laplanders. In this district he ascended a noted mountain called Wallevari, in speaking of which he has given us a pleasant relation of his finding a singular and beautiful new plant (*Andromeda tetragona*), when travelling within the arctic circle, with the sun in his view at midnight, in search of a Lapland hut. From hence he crossed the Lapland Alps into Finmark, and traversed the shores of the North Sea as far as Sallero.

These journeys from Lula and Pitha on the Bothnian Gulf, to the north shore, were performed on foot; and he was attended by two Laplanders, one his interpreter, and the other his guide. He tells us that the vigour and strength of these two men, both old, and sufficiently loaded with his baggage, excited his admiration, since they appeared quite unfatigued by their labour, whilst he himself, although young and robust, was frequently quite exhausted. In this journey he was wont to sleep under the boat with which they forded the rivers, as a defence against rain, and the gnats, which in the Lapland summer are not less teasing than in the torrid zone. In descending one of these rivers, he narrowly escaped perishing by the oversetting of the boat, and lost many of the natural productions which he had collected.

Linnæus thus spent the greater part of the summer in examining this arctic region, and those mountains on which, four years afterwards, the French philosophers secured immortal fame to Sir Isaac Newton. At length, after having suffered incredible fatigues and hardships, in climbing precipices, passing rivers in miserable boats, suffering repeated vicissitudes of heat and cold, and not unfrequently hunger and thirst, he returned to Torneo in September. He did not take the same route from Torneo as when he set out for Lapland, having determined to visit and examine the country on the eastern side of the Bothnian Gulf. His first stage, therefore, was to Ula in East Bothnia, and thence to Old and New Carlebay, eighty-four miles south from Ula. He continued his route through Wasa, Christianstadt, and Biorneburg, to Abo, a small university in Finland. Winter was now setting in apace; he therefore crossed the gulf by the island of Aland, and arrived at Upsala in November, after having performed, mostly on foot, a journey of ten degrees of latitude in extent, exclusively of those deviations which such a design rendered necessary.

In 1733 he visited and examined the several mines in Sweden, and made himself so well acquainted with mineralogy and the docimastic art, that he was sufficiently qualified to give lectures on these subjects upon his return to the university. The outlines of his system of mineralogy appeared in the early editions of the *Systema Naturæ;* but he did not exemplify the whole until the year 1768.

In the year 1734 Linnæus was sent by Baron Reuterholm, governor of Dalecarlia, with several other naturalists in that province, to investigate the physical productions of that part of the Swedish dominions; and it was in this journey that he first laid the plan of an excellent institution, which was afterwards executed, in a certain degree at least, by himself, with the assistance of many of his pupils, and the result published under the title of *Pan Suecicus*, in the second volume of the *Amœnitates Academicæ.*

After the completion of this expedition, it appears that Linnæus resided for a time at Fahlun, the principal town in Dalecarlia, where he tells us that he taught mineralogy and the docimastic art, and practised physic; and where he was very hospitably treated by Dr More, the physician of the place. It also appears that he contracted at this time an intimacy with one of that gentleman's daughters, whom he married about five years afterwards, upon his settling as a physician at Stockholm. In this journey he extended his travels quite across the Dalecarlian Alps into Norway; but we have no particular account of his discoveries in that kingdom. In 1735 Linnæus travelled over many other parts of Sweden, some parts of Denmark and Germany, and fixed in Holland, where he chiefly resided until his return to Stockholm, about the year 1739. In 1735, the year in which he took the degree of doctor of physic, he published the first sketch of his *Systema Naturæ*, in a very compendious way, and in the form of tables, only in twelve pages in folio. By this it appears that he had at a very early period of his life, certainly before he was twenty-four years of age, laid the basis of that great structure which he afterwards raised, not only to the increase of his own fame, but to that of natural science.

In 1736 Linnæus arrived in England, and visited Dr Dillenius, the learned professor at Oxford, whom he justly considered as one of the first botanists in Europe. He mentions with particular respect the civilities he received from Dillenius, and the privileges he gave him of inspecting his own and the Sherardian collections of plants. It is needless to say, that he visited Dr Martyn, Mr Rand, and Mr Miller, and that he was in a more singular manner indebted to the friendship of Dr Isaac Lawson. He also contracted an intimate friendship with Mr Peter Collinson, which was reciprocally increased by a multitude of good offices, and continued to the last without any diminution. Dr Boerhaave had furnished him with letters to Sir Hans Sloane; but these, it seems, did not procure him the reception which the warmth of his recommendation appeared to claim.

One of the most agreeable circumstances that happened to Linnæus during his residence in Holland, arose from the patronage of Mr Clifford, in whose house he lived a considerable part of his time, being now as it were the child of fortune. *Exivi patriâ triginta sex nummis aureis dives*, are his own words. With Mr Clifford, however, he enjoyed pleasures and advantages scarcely at that time to be met with elsewhere in the world; that of a garden excellently stored with the finest exotics, and a library furnished with almost every botanic author of note. How happy he found himself in this situation, those only who have felt the same kind of ardour can conceive. Whilst in Holland, Linnæus was recommended by Boerhaave to fill the place, then vacant, of physician to the Dutch settlement at Surinam; but he declined it on account of his having been educated in so opposite a climate.

Besides being favoured with the particular patronage and friendship of Boerhaave and Mr Clifford, as has already been mentioned, he had also the pleasure of being contemporary with, and of reckoning amongst the number of his friends, many other learned persons who have since proved ornaments to their profession, and whose merit has most deservedly raised them to fame and honour. Amongst these may be mentioned Dr John Burmann, professor of botany at Amsterdam, whose name and family are well known in the republic of letters, and to whom our author dedicated his *Bibliotheca Botanica*, having been greatly assisted in compiling that work, by the free access he enjoyed to that gentleman's excellent library; John Frederick Gronovius of Leyden, editor of Clayton's *Flora Virginica*, and who very early adopted Linnæus's system; Baron Van Swieten, physician to the empress-queen; Isaac Lawson, afterwards one of the physicians to the British army, who died much regretted, at Oosterhout, in the year 1747, and from whom Linnæus received singular and most obliging civilities; Kramer, well known for an excellent treatise on the docimastic art; Van Royen, botanic professor at Leyden; and Lieberkun of Berlin, famous for his skill in microscopical instruments and experiments. To these may also be added the names of Albinus and Gaubius, and of others, were it requisite to show that our author's talents had very early rendered him conspicuous, and gained him the regard of all those who cultivated and patronized any branch of medical science; and to which, doubtless, the singular notice with which Boerhaave had honoured him did not a little contribute.

Early in the year 1738, after Linnæus had left Mr Clifford, and, as it should seem, when he resided with Van Royen, he had a long and dangerous attack of sickness; and upon his recovery went to Paris, where he was kindly entertained by the Jussieus, at that time the first botanists in France. The opportunity this gave him of inspecting the *Herbaria* of Royen and Tournefort, and those of the above-named gentlemen, afforded him great satisfaction. He had intended to proceed from thence into Germany, to visit Ludwig and Haller, with whom he was in close correspondence; but he was not able to complete this part of his intended route, and was obliged to return without this gratification.

Our author did not fail to avail himself of the advantages which access to the several museums of this country afforded him, in every branch of natural history; and the number and importance of his publications, during his absence from his native country, sufficiently demonstrate that fund of knowledge which he must have imbibed before, and no less testify his extraordinary application. These were, *Systematis Naturæ, Fundamenta Botanica, Bibliotheca Botanica*, and *Genera Plantarum;* the last of which is justly considered as the most valuable of all the works of this celebrated author. The immense application bestowed upon it the reader may easily conceive, when he is informed, that before the publication of the first edition the author had examined the characters of eight thousand flowers. The last book of Linnæus's composition, published during his stay in Holland, was the *Classes Plantarum*, which is a copious illustration of the second part of the *Fundamenta.*

About the latter end of the year 1738, or the beginning of the next, Linnæus settled as a physician at Stockholm, where he seems to have met with considerable opposition, and was oppressed by many difficulties; but all of these he at length overcame, and got into extensive practice; and, soon after his settlement, married the lady before mentioned. By the interest of Count Tessin, who was afterwards his great patron, and even procured medals to be struck in honour of him, he obtained the rank of physician to the fleet, and a stipend from the citizens for giving lectures in botany. And what at this time especially was highly favourable to the advancement of his character and fame, by giving him an opportunity of displaying his abilities, was the establishment of the Royal Academy of Sciences at Stockholm, of which Linnæus was constituted the first president, and to which the king granted several privileges, particularly that of free postage to all papers directed to the secretary. By the rules of the academy, the president held his place but three months. At the expiration of that term, Linnæus made his *Oratio de memorabilibus in Insectis*, on the 3d of October 1739; in which he endeavours to excite an attention and inquiry into the knowledge of insects, by displaying the many singular phenomena that occur in contemplating the nature of those animals, and by pointing out, in a variety of instances, their usefulness to mankind in particular, and to the economy of nature in general.

During all this time, however, Linnæus appears to have had his eye fixed upon the botanical and medical chair at Upsala, then occupied by Rudbeck, who was far advanced in life. We learn indeed that he was so intent on pursuing and perfecting his great designs in the advancement of his favourite study of nature, that he had determined, if he failed in procuring the professorship at Upsala, to accept the offer which had been made to him by Haller, of filling the botanic chair at Göttingen. However, in course of time, he obtained his wish. In the year 1741, upon the resignation of Roberg, he was constituted joint professor of physic, and physician to the king, with Rosen, who had been appointed in the preceding year on the death of Rudbeck. These two colleagues agreed to divide the medical departments between them; and their choice was confirmed by the university. Rosen took anatomy, physiology, pathology, and the therapeutic part; Linnæus, natural history, botany, materia medica, dietetics, and the diagnosis morborum.

During the interval of his removal from Stockholm to Upsala, in consequence of this appointment, our professor was deputed by the states of the kingdom to make a tour to the islands of Oeland and Gothland in the Baltic, attended by six of the pupils, commissioned to make such inquiries as might tend to improve agriculture and arts in the kingdom, to which the Swedish nation had for some time paid particular attention. The result of this journey was very successful, and having proved fully satisfactory to the states, was afterwards communicated to the public. On his return he entered upon the professorship, and on the 17th of October pronounced before the university his oration *de Peregrinationum intra Patriam necessitate*, in which he forcibly displays the usefulness of such excursions, by pointing out to the students that vast field of objects which their country held out to their cultivation, whether in geography, physics, mineralogy, botany, zoology, or economics, and by showing the benefit that must accrue to themselves and their country as rewards of their diligence. The animated spirit which pervades the whole of this composition renders it one of the most pleasing and instructive of all our author's productions.

Linnæus was now fixed in the situation which was the best adapted to his character, his taste, and abilities; and which seems to have been the object of his ambition and the centre of his hopes. Soon after his establishment, he laboured to get the academical garden, which had been founded in 1657, put upon a better footing, and very soon effected it, procuring also a house to be built for the residence of the professor. The whole had been in ruins ever since the fire in 1702; and at the time Linnæus was appointed professor of botany, the garden did not contain above fifty plants that were exotic. His correspondence with the first botanists in Europe soon supplied him with great variety. He received Indian plants from Jussieu of Paris, and from Van Royen of Leyden; European plants from Haller and Ludwig: American plants from Mr Collinson, Mr Catesby and others; and a variety of annuals from Dillenius; in short, how much the garden owed to his diligence and care in a few years, may be seen by the catalogue published under the title of *Hortus Upsaliensis, exhibens plantas exoticas horto Upsaliensis Academiæ a sese* (*Linnæo*) *illatas ab anno* 1742, *in annum* 1748, *additis differentiis synonymis, habitationibus, hospitiis, rariorumque descriptionibus, in gratiam studiosæ juventutis*, Holm. 1748, 8vo. By this catalogue it appears that the professor had introduced eleven hundred species, exclusively of all the Swedish plants and varieties, which, in ordinary gardens, amount not unfrequently to one third of the whole number. The preface contains a curious history of the climate at Upsala, and the progress of the seasons throughout the whole year.

From the time that Linnæus and Rosen were appointed professors at Upsala, it should seem that the credit of that university, as a school of physic, had been increasing: numbers of students resorted thither from Germany, attracted by the character of these two able men; and in Sweden itself many young men were invited to the study of physic by the excellent manner in which it was taught, who otherwise would have engaged in different pursuits.

Whilst Linnæus was meditating one of his capital performances, which had long been expected and greatly wished for, he was interrupted by a tedious and painful attack of the gout, which left him in a very weak and dispirited state; and, according to the intelligence which his friends gave of him, nothing was thought to have contributed more to the restoration of his spirits than the seasonable acquisition, at this juncture, of a collection of rare and undescribed plants.

The fame which our author had now acquired by his *Systema Naturæ*, of which a sixth edition, much enlarged, had been published at Stockholm in 1748, in 8vo, with eight tables explanatory of the classes and orders, had brought, as it were, a conflux of every thing rare and valuable in every branch of nature, from all parts of the globe, into Sweden. The king and queen of Sweden had their separate collections of rarities, the former at Ulricksdahl, and the latter, very rich in exotic insects and shells, procured at a great expense, at the palace of Drottningholm, both of which our author was employed in arranging and describing. Besides these, the museum of the Royal Academy of Upsala had been augmented by a considerable donation from the king, whilst hereditary prince, in 1746, by another from Count Gyllenborg the year before, and by a third from M. Grill, an opulent citizen of Stockholm.

From this time the professor appeared in a more elevated rank and situation in life. His reputation had already procured him honours from almost all the royal societies in Europe; and his own sovereign, sensible of his merit, and greatly esteeming his character and abilities, favoured him with a mark of his distinction and regard, by creating him a knight of the polar star. With science, it was no longer *laudatur et alget.* His emoluments kept pace with his fame and honours; his practice in his profession became lucrative; and we find him soon after possessed of a country-house and gardens at Hammarby, about five miles from Upsala. He had moreover received one of the most flattering testimonies of the extent and magnitude of his fame that perhaps was ever shown to any literary character, the state of the nation which conferred it, and all its circumstances, being duly considered. This was an invitation to Madrid from the king of Spain, there to preside as a naturalist, with the offer of an annual pension for life of two thousand pistoles, letters of nobility, and the perfect free exercise of his own religion. But, after the most perfect acknowledgments of the singular honour done him, he respectfully answered, "that if he had any merits, they were due to his own country."

In the year 1755, the Royal Academy of Sciences at Stockholm honoured our professor with one of the first premiums, agreeably to the will of Count Sparree, who had decreed two gold medals, of ten ducats value each, to be annually given by the academy to the authors of such papers, in the preceding year's Stockholm Acts, as should be adjudged most useful in promoting agriculture particularly, and all branches of rural economy. This medal bore on one side the arms of the count, with this motto, *Superstes in scientiis amor Frederici Sparree.* Linnæus obtained it in consequence of a paper *De plantis quæ Alpium Suecicarum indigenæ, magno rei œconomicæ et medicæ emolumento fieri possint;* and the ultimate intention was to recommend these plants as adapted to culture in Lapland. This paper was inserted in the Stockholm Acts for 1754 (vol. xv.). Linnæus also obtained the *præmium centum aureorum*, proposed by the Imperial Academy of Sciences at St Petersburg, for the best paper written to establish or disprove, by new arguments, the doctrine of the sexes of plants. It was, if possible, an additional glory to Linnæus to have merited this premium from the St Petersburg Academy, inasmuch as a professor of that society, a few years before, had with more than common zeal, although with a futility like that of the other antagonists of our author, endeavoured to overturn the whole Linnæan system of botany, by attempting to show that the doctrine of the sexes of plants had no foundation in nature, and was unsupported by facts and experiments.

It appears that Linnæus, upon the whole, enjoyed a good constitution; but that he was sometimes severely afflicted with a *hemicrania*, and was not exempted from the gout. About the close of 1776, he was seized with an apoplexy, which left him paralytic; and at the beginning of the year 1777, he suffered another attack, which very much impaired his mental powers. But the disease supposed to have been the more immediate cause of his death, was an ulceration of the urinary bladder, of which, after a tedious indisposition, he died, on the 11th of January 1778, in the seventy-first year of his age. His principal other works, besides those already mentioned, are, The *Iter Oëlandicum et Gotlandicum, Iter Scanicum, Flora Suecica, Fauna Suecica, Materia Medica, Philosophia Botanica, Genera Morborum,* different papers in the *Acta Upsaliensia*, and the *Amœnitates Academicæ.* The last of his treatises was the *Mantissa Altera*, published in 1771; but before his death he had finished the greater part of the *Mantissa Tertia*, afterwards completed and published by his son.

To the lovers of science it will not appear strange that uncommon respect was shown to the memory of this great man. We are told, "that on his death a general mourning took place at Upsala, and that his funeral procession was attended by the whole university, as well professors as students, and the pall supported by sixteen doctors of physic, all of whom had been his pupils." The king of Sweden, after the death of Linnæus, ordered a medal to be struck, one side of which exhibits Linnæus's bust and name, and the other Cybele, in a dejected attitude, holding in her left hand a key, and surrounded with animals and growing plants, with the legend, *Deam luctus angit amissi;* and beneath, *Post Obitum Upsaliæ, die x. Jan.* M.DCC.LXXVIII. *Rege jubente.* The same generous monarch not only honoured the Royal Academy of Sciences with his presence when Linnæus's commemoration was held at Stockholm, but, as a still higher tribute, in his speech from the throne to the assembly of the states, he lamented Sweden's loss by his death.

His stature was diminutive, being below the middle size; his head was large, and its hinder part very high; his look was ardent, piercing, and apt to daunt the beholder; his ear was not sensible to music; and his temper quick, but easily appeased. Nature had, in an eminent manner, been liberal in the endowment of his mind. He seems to have possessed a lively imagination, corrected by a strong judgment, a most retentive memory, unremitting industry, and the greatest perseverance in all his pursuits. This is evident from that continued vigour with which he prosecuted the design, which he appears to have formed so early in life, of totally reforming and constructing anew the whole science of natural history. And this fabric he raised, and gave to it a degree of perfection unknown before; and he had moreover the uncommon felicity of living to see his own structure rise above all others, notwithstanding every discouragement its author at first laboured under, and the opposition it afterwards met with. Neither has any writer more cautiously avoided the common error of building his own fame upon the ruin of another man's. He everywhere acknowledged the peculiar merits of each author's system; and no man appears to have been more sensible of the partial defects of his own. Those anomalies which had principally been the objects of criticism, he well knew that every artificial arrangement must abound with; and having laid it down as a fixed maxim, that every system must finally rest on its intrinsic merit, he willingly committed his own to the judgment of posterity. Perhaps there is no circumstance of Linnæus's life which shows him in a more dignified light than his conduct towards his opponents. Disdaining controversy, and justly considering it as an unimportant and fruitless sacrifice of time, he never replied to any assailant, numerous as they were at one season.

To all who observe the aid which this extraordinary man has brought to natural science, his talents must appear in a very conspicuous point of view; but more especially to those who, from similarity of tastes, are qualified to see more distinctly the vast extent of his original design, the greatness of his labour, and the elaborate execution he has given to the whole. He had a happy command of the Latin language, which alone is the language of science; and no man ever applied it more successfully to his purposes, or gave to description such copiousness, united with that precision and conciseness which so eminently characterize his writings.

The ardour of Linnæus for the study of nature, even from his earliest years, and that uncommon application which he bestowed upon it, gave him a most comprehensive view both of its pleasures and usefulness, at the same time that it opened to him a wide field, hitherto but little cultivated, especially in his own country. Hence he was early led to regret, that the study of natural history, as a public institution, had not made its way into the universities; in many of which, logical disputations and metaphysical theories had too long prevailed, to the exclusion of more useful science. Availing himself therefore of the advantages which he derived from a large share of eloquence, and an animated style, he never failed to display, in a lively and convincing manner, the relation which this study has to the public good; to incite the great to countenance and protect it; to encourage and allure youth into its pursuits, by opening its manifold sources of pleasure to their view, and showing them how greatly this agreeable employment would add, in a variety of instances, both to their comfort and emolument. His extensive view of natural history, as connected with almost all the arts of life, did not allow him to confine these motives and incitements to those only who were designed for the practice of physic. He also laboured to inspire the great and opulent with a taste for this study, and wished particularly that such as were devoted to an ecclesiastical life should possess some share of natural science; not only as a means of sweetening their rural situation, confined, as many are, perpetually to a country residence, but as that which would almost inevitably lead, in a variety of instances, to discoveries.

Linnæus lived to enjoy the fruit of his own labour. Natural history raised itself in Sweden, under his culture, to a state of perfection unknown elsewhere; and was from that time disseminated throughout all Europe. His pupils dispersed themselves all over the globe; and, with their master's fame, extended both science and their own. More than this, he lived to see the sovereigns of Europe found several public institutions in favour of this study; and even professorships established in different universities for the same purpose, chairs which do honour to their founders, and which have excited a curiosity for the science, and a sense of its worth, that cannot fail to advance its progress, and in time to raise it to that rank which it is entitled to hold amongst the pursuits of mankind.

LINOSA, an island in the Mediterranean Sea, belonging to the kingdom of Naples. It is about six miles in circumference, and entirely volcanic, with an extinct crater in its eastern side, and three others, smaller, but distinctly marked, in other parts. It is uninhabited. Long. 12. 52. 9. E. Lat. 35. 51. 50. N.

LINT. See Flax and Linen.

Lint, in *Surgery*, is the scrapings of fine linen, used by surgeons in dressing wounds. It is made into various forms, which acquire different names according to the difference of the figures. Lint made up in an oval or orbicular form is called a *pledgit;* if in a cylindrical form, or in the shape of a date, or olive-stone, it is called a *dossil.*

LINTON, a market-town of Cambridgeshire, in the hundred of Chilford, forty-six miles from London, and ten from Cambridge. The ancient Roman road, the Ikeneld Street, runs to this town, and the river Granta flows at the end of it. The market day is Thursday. The population amounted in 1801 to 1157, in 1811 to 1373, in 1821 to 1519, and in 1831 to 1678.

LINTSTOCK, in military affairs, a wooden staff about three feet long, having a sharp point in one end, and a sort of fork or crotch on the other; the latter serving to contain a lighted match, whilst by the former the lintstock is occasionally stuck in the ground, or in the deck of a ship during an engagement. It is frequently used in small vessels, where there is commonly one fixed between every two guns, by which the match is always kept dry, and ready for firing.

LINZ, a city of Austria, in the circle of Muhlviertel, and province of Upper Ens. It is the capital of the province and the circle, and stands on the right bank of the Danube. It is a well-built city, with three suburbs, a fine market-place, and a castle upon a hill which overlooks it. It contains three churches, three monasteries, and two nunneries, 1280 houses, and 18,500 inhabitants. There is an academical institution, with eighteen professors, directing studies in divinity, law, philosophy, surgery, and medicine, and a library of 22,000 volumes. It is a place of manufacturing industry, producing good woollen cloths, cassimeres, and carpets, as well as some cotton goods and hosiery. It carries on considerable trade by the Danube, both upwards and downwards, and has two fairs annually, which continue fourteen days. Long. 14. 11. 25. E. Lat. 48. 18. 54. N.

Linz, a city, the capital of the circle of the same name, in the Prussian government of Coblentz. It is situated on the river Rhine, and contains 380 houses, with 1980 inhabitants, who grow some wine, and carry on fisheries, and also navigation on the river. Near it are some iron-works.

LINUS, in classical history, a native of Colchis, who was contemporary with Orpheus, and one of the most ancient poets and musicians of Greece. It is impossible, at this distance of time, to discover whether Linus was the disciple of Orpheus, or Orpheus of Linus. The majority, however, seem to decide this question in favour of Linus. According to Archbishop Usher, he flourished about 1280 B. C. and is mentioned by Eusebius amongst the poets who wrote before the time of Moses. Diodorus Siculus tells us, on the authority of Dionysius of Mitylene the historian, who was contemporary with Cicero, that Linus was the first amongst the Greeks who invented verses and music, as Cadmus first taught them the use of letters. The same writer likewise attributes to him an account of the exploits of the first Bacchus, and a treatise upon Greek mythology, written in Pelasgic characters, which were also those used by Orpheus, and by Pronapides the preceptor of Homer. Diodorus says that he added the string called *lichanos* to the Mercurian lyre, and ascribes to him the invention of rhythm and melody, which Suidas, who regards him as the most ancient of lyric poets, confirms. Marpurg conceives that Linus invented catgut strings for the use of the lyre, which, before his time, was only strung with thongs of leather, or with different threads of wax strung together. He is said by many writers to have had several disciples of great renown; amongst whom were Hercules, Thamyris, and, according to some, Orpheus. Hercules, says Diodorus, in learning from Linus to play upon the lyre, being extremely dull and obstinate, provoked his master to strike him; which so enraged the young hero, that instantly seizing the lyre, he beat out the brains of the musician with his own instrument.

LIONCELLES, in *Heraldry*, a term used for several lions borne in the same coat of arms.

LIOTARD, called the *Turk*, an eminent painter, was born at Geneva in 1702, and was intended by his father to be a merchant; but, by the persuasion of his friends, who observed the genius of the young man, he was permitted to give himself up to the art of painting. He went to Paris in 1725, and in 1738 accompanied to Rome the Marquis de Puisieux, who was going as ambassador to Naples. At Rome he was taken notice of by the Earls of Sandwich and Besborough, who engaged Liotard to attend them in a voyage to Constantinople. There he became acquainted with Lord Edgecumbe, and with Sir Everard Fawkener, our ambassador, who persuaded him to proceed to England, where he staid two years. In his journey to the Levant he had adopted the eastern habit, and wore it here with a very long beard. It contributed much to the portraits which he drew of himself, and, some thought, to draw customers; but he was really a painter of uncommon merit. After his return to the Continent, he married a young wife, and sacrificed his beard to Hymen. He came again to England in 1772, and brought a collection of pictures of different masters, which he sold by auction, and some pieces of glass painted by himself, with surprising effect of light and shade, but which were a mere curiosity, as it was necessary to darken the room before they could be seen to advantage. He remained here about two years, as in his former journey. He has engraved some Turkish portraits, one of the empress queen, and the eldest archduchess, in Turkish habits, besides the heads of the emperor and empress. He painted well in miniature, and also in enamel, though he seldom practised it. But he is best known by his works in crayons. His likenesses were as exact as possible, sometimes too like to please those who sat to him. Being devoid of imagination, he could render nothing but what he saw before his eyes. Freckles, marks of the small-pox, every thing found its place; not so much from fidelity, as because he could not conceive the absence of any thing that appeared to him. Truth prevailed in all his works, grace in few or none. Nor was there any ease in his outline; the stiffness of a bust prevailed in all his portraits.

LIPARI, the collective name of a group of islands in the Mediterranean Sea, forming a part of the kingdom of Naples. They were known in the most remote ages as the Ephestiades, in the subsequent centuries as the Æolian Islands, and latterly have commonly borne the name of the most considerable of their number. According to the mythology of the heathens, they were imagined to be the chimneys of a vast subterraneous cavity, inhabited by Steropes, Brontes, and Argos; and the caverns in which Æolus confined the winds were in this archipelago. Here Diana was said to have been placed by Latona in her infancy, and here also Vulcan forged the thunderbolts of Jupiter.

It is most probable that, at an early period, Liparus, the son of Auson, having passed from Italy with some of his followers, planted the largest of the islands, and conferred his name upon it. Æolus, the son of Hippotas, arrived afterwards, and marrying Cyane, the daughter of Liparus, succeeded to the throne; and being very attentive to meteorology, and often successfully predicting changes of weather, this may have given rise to the fabulous power attributed to him. This colony had suffered a decline, in spite of an augmentation of the inhabitants by the immigration of some Rhodians and Cnidians, when it was visited by some Etruscan pirates, who built the city of Lipari, and, by means of husbandmen transported from the continent, extended cultivation to the other islands. Since that period, they have been subject to Sicily, forming in Christian times a bishopric, restricted in 1394 to these islands. The whole of these islands exhibit the corrosive effects of gases and spray; but their western coasts, rising abruptly in precipitous masses, and shelving down gradually to the eastward, form an interesting geological feature, in which it agrees with the greater part of the West India and other islands. It is remarkable that, besides the western coasts of all these islands being steep and craggy, they have each of them a high isolated rock on their northern shores. The basis of the whole group is hornstone, with the various alterations and decompositions occasioned by volcanic influence; an influence easily traceable throughout these islands, in its grandest and wildest varieties.

The climate is highly salubrious, and the weather generally soft and refreshing; but though there are a few trifling springs, a general scarcity of water is experienced, as the soil, consisting almost entirely of scoriæ, tuffa, pumice, pozzolana, and ashes, without any intervening stony stratum, except occasional masses of obdurate vitrification, rapidly absorbs the moisture. The natives are consequently obliged to construct capacious cisterns, in which rain-water is preserved in a cool temperature. Most of the cattle are lean, and they are not abundant, as the pasturage is only adapted for the most part to the feeding of goats. The land is well cultivated, and yields grapes, currants, figs, prickly pears, corn, cotton, olives, and pulse, which latter grow under the cane trellises that support the vines. Violent rains sometimes cause great injury to the grounds, owing to their situation, and the friability of the soil; and at other times swarms of locusts greatly injure and diminish the produce. A large quantity of wine and currants is annually exported, and an active trade is carried on in bitumen, pumice, nitre, pozzolana, cinnabar, coral, and fish. At one period alum formed a considerable article of export, but it has decreased, probably owing to the diminished heat of the subterranean fires. Some sulphur is still shipped, but in less quantity than formerly, owing to a prejudice entertained by the inhabitants, that the vapour which arises from purifying it infects the air, and is injurious to vegetation.

The inhabitants, who amount in all these islands to 22,350, are contented, temperate, and hardy, and are esteemed excellent sailors; but they are commonly considered as impertinent, mean, and immoral. They are by no means rich, but few are in extreme poverty; and, from leading an active life, they are healthy, except that, from their filthy habits, the itch is very prevalent amongst all classes. They are described as very expert slingers and throwers of stones, a valuable talent in an unarmed population, exposed to predatory visits from corsairs. The islands are variously enumerated, some stating them to be eight or nine, and others eleven. This has arisen from those who stated them at the greater numbers including some which are uninhabited, or may be considered as mere rocks belonging to adjacent islands.

1*st*, The island of Lipari is the largest and most populous of the whole group. It is accessible by a bay on the east side of the island, formed on the north by Monte Rosso, an immense mass of volcanic matter, and on the south by Cape Capistello, a rugged rock of lava. It is hilly, but intermixed with peculiarly beautiful and fertile valleys and plains, from which, amongst other produce, is supplied the Malmsey wine, whose flavour is admired in most parts of the world. The extent of the island is 110 square miles, and the population amounts to about 15,000 persons. Lipari has not suffered from volcanic eruptions for many ages, but its subterraneous fires are not yet extinguished; for, on digging in the central parts of the island to a trifling depth, heat, smoke, and a sulphureous smell, immediately arise. The highest mountain, St Angelo, contains a crater 200 feet wide; and on another mountain, Guardia, the course of the lava from an eruption is still visible. Lipari is literally the wreck of a vast conflagration, and affords perhaps the finest field in the world for the study of the geologist. This island contains the capital, the seat of government of the whole group. It is a city of the same name, situated on the south-east side; it has two havens, is the see of a bishop, and has a castle, a cathedral, and several other churches. It is healthy, though crowded, irregular, and filthy. It contains 12,500 inhabitants. Long. 14. 57. 50. E. Lat. 38. 27. 56. N.

2*d*, Volcano is a lofty island, fifteen miles in circuit, and possesses two small ports on the northern side. At a small distance from these ports is a hill, having a great crater, with a deep valley encircling, and detaching it from the neighbouring hills. It is about 2400 feet in height, but accessible to the summit with no little fatigue and some danger. The crater is a mile and a quarter in circumference, and nearly a quarter of a mile deep, forming an inverted elliptical cone, with the northern considerably higher and hotter than the southern side. The interior is full of volcanic scoriæ, coated over with sulphur, alum, vitriol, and muriate of ammonia, diverging into every possible shade of brown, red, green, blue, orange, black, yellow, and white. From the numerous apertures in every part, a sulphureous and hydrogenous vapour rushes out in gusts, which, when collected on the sides, where a considerable quantity of sulphur has been deposited by sublimation, forms a species of stalactite, covered with boracic or other light efflorescences. The bottom is about two or three hundred yards in extent. There is a frequent explosion of gases, and a continued roar similar to that of a cataract, or of many anchor-smiths' forges, which impress on the imagination the horrid feeling of being only separated by a frail crust from some vast abyss of central fire. Fire is only observable at night, when a pale lambent flame is seen to issue from many of the fissures, accompanied with nauseous fumes and vapours. There are but few inhabitants, and these are mostly employed in the sulphur works. Long. 14. 57. 50. E. Lat. 38. 27. 56. N.

3*d*, Salina. This island is to the north-west of Lipari, and is about fourteen miles in circumference, with an industrious population of 4000 persons, employed in raising grain, fruit, pulse, capers, salt, alum, and soda. Although no mention is made in history of any eruption, it is evidently of volcanic origin, and there are palpable vestiges of its once desolating craters, the fires of which must have ceased before the dawn of history, whilst they have now become the most pleasing and fertile spots of the group of islands. Long. 14. 55. 56. E. Lat. 38. 35. 40. N.

4*th*, Felicudi. This island is ten miles to the westward of Salina, is nine miles in circumference, and contains about 1100 inhabitants. The soil consists chiefly of detached masses of ferruginous and argillaceous lava, strongly marked with white felspars and black schorl, intermixed with enamel, cinders, sand, and pozzolana. It is highly fertile, and produces wheat, barley, grapes, olives, pulse, and flax, in abundance. It is an extinct volcano, with three high mountains; but there are no remains of the fire that produced the island, nor does history give any accounts of eruptions. Long. 14. 29. 37. E. Lat. 38. 34. 5. N.

5*th*, Alicudi. This is the westernmost of the islands, and rises like a cone from the sea, having a crater, the fires of which have been extinct for ages; but the lava is seen in grotesque streams, extending from the summit to the sea. The few spots capable of cultivation are highly fertile, and support 750 inhabitants. Long. 14. 16. 30. E. Lat. 38. 32. 41. N.

6*th*, Panaria, a small island to the north of Lipari, is seven miles in circumference, has a good port, and about two hundred inhabitants, who, from a rich soil, produce corn, wine, soda, and especially excellent raisins. The rocks around it, called the Dattoli, appear to have formed the circumference of an immense crater. It was known by the Romans as *Thermissea*, and was celebrated for its warm baths. Long. 15. 2. 55. E. Lat. 38. 37. 40. N.

7*th*, Basiluzzo, a small island to the north of Panaria, is about a mile and three quarters in circumference, and is very thinly inhabited. It produces corn, flax, and culinary vegetables, and is overrun with rabbits, which injure the crops. Like the rest of the group, this island exhibits abundant proofs of its volcanic origin. Long. 15. 7. 54. E. Lat. 38. 39. 50. N.

8*th*, Stromboli, the most northern of this group of islands, was known to the ancients by the name of *Strongyle*. It is a conical mountain, with an irregular base. It is upwards of 2000 feet high, is bifurcated, and about nine miles in circumference; and, from every indication, seems an evident product of subterranean fire. The crater has been rarely visited, on account of the great difficulty of ascending to it. The best description is that of Captain William Henry Smyth, who surveyed the whole of these islands, as well as the shores of the Mediterranean. About one third of the way from the summit of the mountain the crater appears. It is continually burning, with frequent explosions, and a constant ejection of fiery matter. It is of a circular form, about one hundred and seventy yards in diameter, with a yellow efflorescence adhering to its sides like that of Ætna. When the smoke clears away, an undulating igneous substance is to be seen, which at short intervals rises and falls with great agitation, and, when swollen to the utmost height, bursts with a violent explosion and a discharge of red-hot stones in a semi-fluid state, accompanied with showers of ashes and sand, and a strong sulphureous smell. The masses are usually thrown up to the height of from sixty or seventy to three hundred feet; but some, the descent of which Captain Smyth found to occupy from nine to twelve seconds, must have ascended above a thousand. In the moderate ejections, the stones in their ascent gradually diverge like a pyrotechnical exhibition, and fall into the abyss again, except on the side next the sea, where they roll down in quick succession, after bounding from the declivity, to a considerable distance in the water. This crater, which is on the north-west side of the mountain, has burned without intermission from the earliest periods. The incessant combustion is supposed to be kept up by oxygen, pyrites, and sulphur; but there are no traces of the presence of bitumen. It appears to be not only the vent of all these islands, but to have a subterraneous communication with Sicily and Italy; for, previous to a severe earthquake taking place in those parts, Stromboli has been observed to be covered with dense clouds of smoke, and to emit, with increased activity, unusually ardent flames. It appears, moreover, from the concurrent relation of the islanders, to be influenced by atmospheric changes, as storms, particularly those from the southward, which are preceded by thick volumes of smoke, so that the native pilots are guided at night by its flame, and gain intimation of the weather by day from the smoke.

The island contains about 1200 inhabitants, who have neither magistrate nor lawyer, but are governed by two priests. The soil is a fertile black mould, producing wine, wheat, barley, cotton, raisins, currants, and figs. There is an extinct volcano on Mount Schicceola, which burned in the time of Aristotle, and was noticed by him. The church is dedicated to St Bartholomew, and is in long. 15. 13. 10. E. and lat. 38. 48. 12. N.

LIPES, a province of Bolivia, or Upper Peru, in the department of Potosi, about sixty leagues long from north-west to south-east, and twenty in breadth. It was formerly a place of great wealth, possessing a considerable number of valuable mines; but many of them have been abandoned on account of the breaking in of water. It has still two mines of gold, one of silver, and one of copper; together with mines of red and white copper, the strata of which are intermixed with gold, silver, iron, and loadstone. The climate is generally cold, and the land unfruitful; but there are particular parts where it is good, and vegetation considerable. Cattle are found in great abundance, inhabiting that part of the chain of the Andes which intersects the province. There are also great numbers of birds.

LIPES, the capital of the above province, was formerly a large and populous town, but has gradually decayed in importance with the province. It is now a small and miserable place. Long. 68. 16. W. Lat. 21. 40. S. The population of the district and town is estimated at about 20,000.

LIPEZK, a circle in the Russian province of Tambow, extending from north latitude 52. 6. to 52. 4., and from east longitude 39. 18. to 40. 32., and containing 1208 square miles. It consists of an extended plane, which includes some steppes, and is more abundant in corn than in wood. It is watered by the rivers Woronesh and Worona. The capital is the city of the same name situated on the Woronesh, 760 miles from St Petersburg, containing 1015 houses and 6440 inhabitants. Long. 39. 45. E. Lat. 52. 50. N.

LIPPA, a fortified town of the circle of Arad, in the province of Farther Theiss, in Hungary. It stands on the river Maros, has a Catholic and a Greek church, and is the seat of a protopope. It contains 390 houses, and 2530 inhabitants, who make much culinary salt, and grow good corn and wine. Long. 21. 35. 7. E. Lat. 46. 5. 9. N.

LIPPE, the capital of a county of the same name in the circle of Westphalia, in Germany. It is situated on a river of the same name, and was formerly the residence of the principal branch of the house of Lippe. It is now in the possession of the king of Prussia, and carries on a good trade in preparing timber for building vessels on the Rhine, with which it has a communication by the river Lippe. The country round it is unwholesome and marshy. Long. 8. 12. E. Lat. 51. 43. N.

LIPPE-DETMOLD, a principality in the north-west of Germany. It is bounded on the north by the Prussian Westphalian province, on the north-east by Schauenburg, on the east by Hanover and Waldeck, and on the south-east, south, and west by the Prussian provinces. It is 453 square miles in extent, and comprehends six walled towns, five market-towns, and 145 villages, with 71,450 inhabitants. It is a hilly and woody district, between the Rhine and the Weser. On the slope of the hills there is some good wheat and rye land, but the whole principality produces barely corn sufficient for the consumption, and the cultivation of potatoes has been of late years extended in a degree commensurate with the increase of the population. The only articles for exportation furnished by the state are wood, which passes down the Weser to Bremen; flax and linen yarn, which is sold to the makers of linen in Lemgo, Bielfield, and other parts of Westphalia; and wool, which passes by Bremen to England or Holland. There are no mines, but there is a saline spring at Salzuflen, from which 35,000 bushels of culinary salt are prepared. The income of the state is about L.48,000 yearly, of which L.30,000 is derived from the princely domains and royalties. There was a national debt till lately, but it is nearly discharged by a sinking fund. The military force consists of a battalion of infantry, containing 300 men; besides which there is a militia, in which every man is liable to serve. The principality is divided into twelve bailiwicks. The capital is the city of Detmold, containing 2500 inhabitants.

LIPPI, Lorenzo, an historical and portrait painter, was born in 1606, and learned the principles of painting from Matteo Roselli. He had a fine genius for music and poetry, as well as for painting; and in the latter his proficiency was so great, that some of his compositions in the historical style were taken for those of Roselli. But becoming dissatisfied with the manner of that master, he chose that of Santi di Titi, who was excellent both in design and invention, and appeared to have more of simple nature and truth in his compositions than any other artist of that time. At Florence Lippi painted many excellent designs for the chapels and convents, by which he extended his reputation; and at the court of Innspruck he painted a great number of portraits of the first nobility, which were deservedly admired. Yet, although he was fond of imitating simple nature without any embellishments of invention, his works are held in the highest esteem for the graceful airs of the heads, the correctness of his outline, and the elegant disposition of the figures. He died in 1664.

LIPPSTADT, a city, the capital of a circle of the same name in the Westphalian Prussian government of Arensburg. It stands on the river Lippe, and contains 575 houses and 3290 inhabitants. There are in it one Catholic, one Calvinist, and four Lutheran churches. One half of the city belongs to the prince of Lippe-Detmold, but the garrison consists of Prussians, and the officers of that monarch regulate the affairs of the post. There is some trade in linen and woollen goods, and in making oil, soap, vinegar, and corn spirits. Long. 7. 45. 55. E. Lat. 51. 38. 59. N.

LIPSIUS, Justus, a critic and antiquary of high reputation, was born on the 18th of October 1547, at the village of Isque, situate at an equal distance from Brussels and Louvain. His father, Gilles Lipse, a native of Brussels, belonged to one of the best families of that city, and inherited considerable property, which he impaired by his improvident mode of life. The name of his mother was Isabelle Petirive. At the age of six he removed to Brussels along with his parents; and being then sent to school, he discovered great aptitude for acquiring the elements of learning. Having reached his tenth year, he was placed at Ath in Hainaut, where he was initiated in Latin grammar; and after another interval of two years, he became a student in the college of the Jesuits at Cologne. There he devoted himself to the study of the Greek language, and likewise of history and philosophy. It was the policy of the Jesuits to allure into their society such of their pupils as exhibited the greatest promise of talent; and this young scholar was nearly entangled in their net, when his parents, having heard of his desire to enrol himself in the fraternity, recalled him from Cologne, and sent him to the university of Louvain. He had then attained the age of seventeen, and had already begun to exhibit various indications of his future eminence in letters. His father had destined him for the legal profession, and, that he might seem to comply with his wishes, the son bestowed some attention upon the study of jurisprudence; but philology and philosophy were his favourite pursuits, and of his proficiency in philology he exhibited a very early and conspicuous specimen. The death of his father, when he himself had nearly completed the eighteenth year of his age, left him at full liberty to devote himself to such studies as best suited his own inclination. After this event, his mother fixed her residence at Louvain, bringing with her an only daughter: she made a strenuous effort to preserve the remnant of their fortune, but her worldly cares were soon terminated by a dropsy. In the year 1567, before he had completed the age of twenty, he published his "Variarum Lectionum libri tres," which he dedicated to Cardinal de Granvelle, and which procured him no mean reputation as a critic. It likewise had the effect of recommending him to the favour of this dignitary; who on proceeding to Rome for the purpose of assisting at the election of a pope, was accompanied by Lipsius in the capacity of his Latin secretary.

Here he had an opportunity of attending the prelections of Muretus, who was at that time a professor in the university of Rome; and with this very elegant scholar he appears to have contracted some degree of intimacy. He likewise became acquainted with several other learned men who then resided in Italy. His leisure hours were chiefly devoted to the examination of manuscripts preserved in the Vatican and other libraries; nor did he neglect those monuments of antiquity which, in so many different forms, solicited the notice of a young and ardent scholar. In the service of the cardinal he continued nearly two years; and having then returned to Louvain, and being released from all his engagements, as well as from all restraint, he there spent another year with little improvement of his learning or morals. But he at length became sensible of the folly of a life wasted in the frivolous and unsatisfactory pursuit of pleasure; and in order to effect a complete interruption of his habits and associations, he adopted the prudent resolution of again travelling in foreign countries. On passing through Franche Comté, he directed his course to Dole, the seat of a university, and there pronounced a panegyric on his friend Victor Giselin, on the occasion of his taking a doctor's degree in physic. To the banquet which followed this ceremony he did so much honour, that he was seized with a fever which endangered his life. On regaining sufficient strength, he pursued his journey to Vienna, and there became acquainted with Busbequius, Sambucus, Pighius, and other men of learning. Such was the impression of his talents and attainments, that he was solicited to remain in the Austrian dominions; but he declined more than one offer of employment, and adhered to the resolution of returning to his native country. Proceeding to Bohemia, he visited Prague, and was travelling through Germany, when he received an alarming account of the progress of the war in the Netherlands, and the serious injury to which his own property had been exposed. In this situation of his affairs, he was glad to accept the professorship of history and eloquence in the university of Jena. To this office he was admitted in the year 1572, and he retained it till the first of May 1574, when some indications of a favourable change had encouraged him to think of revisiting his native soil. But he first directed his course towards Cologne, where he married a widow named Anne Calstrie, who was descended of a good family at Louvain, and by whom he had no children. His first edition of Tacitus was printed in octavo, at Antwerp, in the year 1574. To the illustration of this favourite author he afterwards devoted much labour; and a sixth edition, in folio and quarto, was printed at the same place in 1600. His "Antiquarum Lectionum libri quinque" were printed at Antwerp in 1575.

Having lingered nine months at Cologne, he conducted his wife to Isque, where he hoped to lead a life of studious tranquillity; but his dreams of felicity were speedily dispelled by the renewal of hostilities in that vicinity, and he found it expedient to seek shelter at Louvain. At the suggestion of his friends, he resumed the study of jurisprudence, and in the year 1576 he took the degree of LL. D. His taste and inclination did not lead him to the practice of this profession; but his knowledge of the civil law was of material use in the illustration of Roman antiquities. In 1577 he published his "Epistolicarum Quæstionum libri quinque; in quîs ad varios Scriptores, pleræque ad T. Livium, Notæ." Here he could not long pursue his studies without alarm and danger: the war continuing with unabated vigour, Louvain was exposed to a siege, and changed its masters. After this event, he was offered the professorship of history in the university of Leyden; to which he accordingly removed in the year 1579, and there taught with high reputation. At Louvain he was a papist, at Jena he had been a Lutheran, and at Leyden he now became a Calvinist; if any adequate preferment had allured him to Constantinople, he would in all probability have become a Mohammedan. Towards the close of his life, Lipsius denied that he had ever conformed to the established church of Holland; but if any regard is due to this denial, how are we to understand the positive declaration of his zealous biographer Le Mire, who has stated that after his retreat from Leyden, he was publicly reconciled to the church of Rome? If he had never forsaken its communion, where was the necessity or the pretext for such a reconciliation? Niceron admits that he long appeared to be very indifferent about religion, and that it was his great principle to conform to the religion of the place where he resided; but, subjoins the reverend father, he at length quitted this state of indifference, and was constantly and sincerely attached to the Catholic faith, in which he was born.[1] Of the sincerity of a man who had so long adhered to this great principle, that is, who had so long evinced a total want of principle, it would seem but reasonable to require some very substantial evidence. During the latter years of his life, he certainly adhered to the tenets of popery, and endeavoured to signalize his zeal by professing to merge his intellect in the most abject superstition: but this was perhaps the mere zeal of a convert making his third profession, and fully aware of the extreme suspicion which his previous conduct could not have failed to excite; and had the course of his fortunes finally conducted him from Louvain to Oxford, it is by no means a violent or uncharitable supposition that he might have closed his career in the odour of high-church sanctity.

At Leyden he produced several of his more elaborate works. In 1580 appeared "Electorum liber primus," and in 1582 "Electorum libri duo; in quibus, præter Censuras, varii prisci Ritus;" in 1584 "De Amphitheatro liber; in quo Forma ipsa Loci expressa, et ratio spectandi;" to which is subjoined "De Amphitheatris quæ extra Romam libellus;" and in 1585 "Saturnalium Sermonum libri duo, qui de Gladiatoribus." In 1586 he published "De recta Pronuntiatione Latinæ Linguæ Dialogus;" of which dialogue the scene is laid in Rome, and the interlocutors are Lipsius and Muretus. It is dedicated to Sir Philip Sidney. His edition of the tragedies ascribed to Seneca was printed in 1588. Nor were his enquiries confined to philology and antiquities. In 1584 he had published "De Constantia libri duo, qui Alloquium præcipue continent in publicis Malis;" and in 1589 he produced a more ample work entitled "Politicorum, sive Civilis Doctrinæ, libri sex, qui ad Principatum maxime spectant." The publication of this work was attended with some unpleasant consequences to the author, and it served to evince that his wisdom was not equal to his learning. He recommends, in very plain terms, the punishment of heretics, or, in other words, of those who dissent from the established faith; nor can it escape the observation of the most obtuse reader that this recommendation proceeded from a man who, according to his own doctrine, ought to have been punished at Jena if he had adhered to the opinions which he professed at Louvain, who ought to have been punished at Leyden if he had adhered to the opinions which he professed at Jena. But it must be admitted that his conduct was perfectly consistent in one respect, inasmuch as he changed his religion as often as he changed his place of residence. Wherever his lot was cast, he was never to be found among the nonconformists. This doctrine of exterminating heresy by fire and sword, proceeded with a peculiar grace from an individual who, having escaped from the wreck of his fortunes, had been protected and cherished by a people so recently released from the iron yoke of Spain, with all the atrocities of the Spanish inquisition. His intolerant opinions were immediately attacked by Theodore Koornhert; and finding himself placed in a situation of no small embarrassment, he, in 1590, made a very abortive attempt to defend himself, in a work entitled "De una Religione adversus Dialogistam liber; in quo tria capita libri quarti Politicorum explicantur." His antagonist prepared a reply, which was not printed till after the death of the author.[2] In consequence of these illiberal and unseasonable speculations, he probably found that his residence in Holland had been rendered less agreeable. Under the pretext of drinking the medicinal waters, he proceeded to Spa, and afterwards withdrew to Mentz, where the Jesuits gladly received the lost sheep returning to the sheepfold. From this place, on the 14th of April 1591, he addressed a canting letter to Delrio, a learned father of the same order; and only a short time elapsed before he was publicly reconciled to that church whose communion he had renounced as often as it suited his interest. So true it is that the bigots of a corrupt church are easily satisfied with a specious show of outward conformity, while the disguise of their votary is too transparent to deceive any one who is unwilling to be deceived. On ascertaining that there was no hope of his returning to

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[1] Niceron, Memoires pour servir à l'Histoire des Hommes illustres, tom. xxiv. p. 110.

[2] See Bayle, Dictionaire Historique et Critique, tom. ii. p. 1723.

Leyden, the curators of the university manifested the utmost anxiety to find another scholar of equal and even superior attainments; and with true discernment they selected Joseph Scaliger, a man distinguished beyond all others by the extent and solidity of his learning. The rulers of the state acted with conspicuous liberality towards him, and afterwards towards Salmasius; "who," as Dr Bentley has remarked, "were invited out of their own country with the solemnity almost of an embassy, that they would honour a potent republic with their presence, and accept of a noble pension without any incumbrance of an office."[1] In many respects, Scaliger was greatly superior to Lipsius, and in none more than in the knowledge of the Greek language and literature, both of which his capacious mind had embraced in their entire compass. His advice and example had a great and lasting influence in recommending this study to the youth of his adopted nation, in which it long continued to flourish with a degree of vigour scarcely equalled in any other country of Europe.[2]

Having entered Mentz as a heretic and quitted it as a good catholic, he afterwards lingered for about two years at Spa and Liege. During this interval, many advantageous offers were made to him by princes and by dignitaries of the church. One offer, not from a king or cardinal, but from a private individual, deserves to be recorded: Benedictus Arias Montanus, a learned Spaniard whose name is so frequently mentioned in the annals of biblical literature, repeatedly urged him to come and share his income during his life, and to be the heir of all his property at his death. But the love of his native land prevailed over many other inducements, and Lipsius finally returned to Louvain as professor of history and eloquence. His salary as a professor amounted to eight hundred florins; and with the title of historiographer royal, Philip the Second bestowed upon him a pension of one thousand. The archduke Albert, governor of the Netherlands, added two hundred florins, and nominated him a member of the council; but having no wish or aptitude to engage in public affairs, he wisely restricted himself to the duties of his academical office. He taught with much ability, and with high reputation, but his lectures did not attract a numerous auditory; the students of that university having been trained by the Jesuits to set a higher value upon scholastic disputation than upon classical erudition.[3] He however continued with unabating ardour to pursue his favourite investigations, and about this period he composed several of his antiquarian works. "De Cruce libri tres, ad sacram profanamque Historiam utiles," appeared in 1595; "De Militia Romana libri quinque; Commentarius ad Polybium," in 1596; "Poliorceticωn, sive de Machinis, Tormentis, Telis, libri quinque," in the same year; "Admiranda, sive de Magnitudine Romana, libri quatuor," in 1598; "De Vesta et Vestalibus," in 1603. In 1604 he published "Manuductionis ad Stoicam Philosophiam libri tres, & Physiologiæ Stoicorum libri tres, L. Annæo Senecæ, aliisque Scriptoribus illustrandis." "Monita et Exempla Politica, libri duo, qui Virtutes et Vitia Principum spectant," followed in 1605. In the course of the same year he published his edition of Seneca the philosopher, and likewise "Lovanium, sive Oppidi et Academiæ ejus Descriptio." It would have been well for his reputation if he had adhered to such lucubrations as these, instead of occupying himself with miserable details of the miracles of our Lady of Hall and of Zichem. In 1604 he published "Diva Virgo Hallensis; Beneficia ejus et Miracula fide atque ordine descripta;" and in 1605 "Diva Sichemiensis, sive Aspricollis; nova ejus Beneficia et Admiranda." These abject tales of superstition exposed him to the ridicule and contempt of protestants, nor have the more rational papists commended him for such a manifestation of his zeal. His idolatry of the wooden goddess[4] afforded occasion for several controversial tracts; and the character of Lipsius was not much indebted to those friends who undertook his vindication. One of his fiercest antagonists was our learned countryman George Thomson, who was a protestant clergyman in France, and the author of several works in French as well as Latin.[5] In the year 1602 the professor had suspended his silver pen in the chapel of our Lady of Hall, to whose intercession he ascribed his recovery from a painful disease; and his votive tablet was ornamented with an effusion in Latin verse, not remarkable for the elegance of the composition. Here we very clearly discern the spirit of pagan idolatry; and it was under the same cloud of superstitious delusion that he awaited the approach of death. His biographer has deemed it worthy of record, that, when the spark of life was nearly extinct, he prayed with great fervour to the blessed virgin: of his reliance on the mercy of God through the atonement and mediation of Christ, we find a less anxious commemoration. With his dying breath he directed his wife to deposit his academical gown at the altar of the virgin in the church of St Peter; and having now testified as much false and as little true devotion as the five priests in attendance could require or expect, he expired on the 23d of March 1606, in the fifty-ninth year of his age. According to the direction of his testament, his remains were interred before the altar of the virgin in the church of the Franciscan friars. His death was lamented and his merits were extolled in prose and in verse by many different writers. One of his admirers undertook to prove that he was a good catholic; and of what materials a good catholic may be composed, we have already had occasion to state. Another, Wower of Antwerp, thought himself well employed in defending the propriety of his devout dedication of an old gown edged with fur; an act of driveling imbecility which had exposed his memory to much sarcastic animadversion.

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[1] Bentley's Dissertation upon the Epistles of Phalaris, p. c.

[2] "Sub ipsa academiæ incunabula Leidæ bonas literas docuit Justus Lipsius, perfectus literis Latinis, Græcarum mediocriter peritus. Is dicere ausus est, Græcas literas homini erudito decoras esse, necessarias non item. Quod stultissimum dictum Isaaco etiam Casaubono, quo non fuit leuioris naturæ criticus, vehementer bilem movit. Sed bonum factum, quod tam perniciosa literis opinio nullas radices egit. Mox enim tamquam cœlo missus Josephus Scaliger, cui Batavi prope omnem rectum ingenii cultum, quem ex eo tempore ceperint, si grati esse velint, acceptum referre debent, Scaliger igitur cum ceteras ingenuas artes, tum Græcas literas, earumque cum Latinis conjunctionem, in his regionibus fundavit. Scaligerana disciplina per Grotios, Heinsios, Gronovios, Grævios, et alios usque ad patrum nostrorum memoriam propagata est." (Ruhnkenii Elogium Tiberii Hemsterhusii: Opuscula, tom. i. p. 268.)

[3] "Docet vir doctus," says Scultet in allusion to Puteanus, "ut et ante ipsum Lipsius, in sterili auditorio, non alia de causa (ex magno viro hoc audivi) quam quod juventus a melioribus studiis ad tricas disputationum scholasticarum per Jesuitas avocatur: a quibus hominibus, imperium in orbis terrarum academias affectantibus, nihil aliud quam barbarica politiorum literarum captivitas est expectanda." (De Curriculo Vitæ, inprimis vero de Actionibus Pragensibus Abrah. Sculteti, p. 66. Emdæ, 1625, 4to.) Erycius Puteanus was the immediate successor of Lipsius.

[4] An anonymous work, written by P. Denaisius, a German lawyer, was published under the following title: "Dissertatio de Idolo Hallensi, Justi Lipsii Mangonio et Phaleris ornato, atque producto." Heidelbergæ, 1605, 4to. This dissertation was answered by a Carmelite friar named Anastase Cochlet: "Palæstrita Honoris D. Virginis Hallensis pro Justo Lipsio." Antv. 1607, 8vo.

[5] Vindex Veritatis: adversus Justum Lipsium libri duo. Prior insanam ejus religionem politicam, fatuam nefariamque de Fato, sceleratissimam de Fraude doctrinam refellit. Posterior Ψευδοπαρθένου Sichemiensis, id est, Idoli Aspricollis, et Deæ ligneæ miracula convellit. Uterque Lipsium ab Orco Gentilismum revocasse docet. Auctore Georgio Thomsono Andreapolitano Scoto-Britanno. Londini, 1606, 8vo. The defence of Lipsius was undertaken by Claude Dausquei, a canon of Tournay, who published a work entitled "Scutum duplex, alterum B. Virginis Aspri-Collensis, alterum J. Lipsii; utrumque adversus Agricolæ Thracii satyricas petitiones." Duaci, 1610, 8vo. Thomson is mentioned in the following terms by Dominicus Baudius: "Georgium Thomsonum amo quidem et æstimo plurimum, ob studium bonarum partium, et egregios in solida doctrina progressus; sed, ut verum apud te fabuler, nullo modo possum probare nimiam ejus violentiam atque asperitatem in nostrum Lipsium: cujus quidem Divarum sanos omnes pudet pigetque, sed tamen majore cum reverentia tractandum fuit præstantissimum pene ingenium hujus seculi, et qui pro parte sua strenue tutatus est literarum gloriam." (Baudii Epistolæ, p. 298. edit. Lugd. Bat. 1650, 12mo.) See likewise p. 242. and Camdeni Epistolæ, p. 71. Lond. 1691, 4to. His treatment of Lipsius is more strongly censured by Scaliger: "De libro Georgii Thomsoni gratias ago. Mitius illi cum Lipsio agendum, et alia via cum illo congrediendum fuit. Nam præfractam illam et gladiatoriam violentiam non laudo. Non enim tanquam vindex veritatis, ut ipse profitetur, sed tanquam ultor offensæ alicujus cum eo agit, quum tamen ab eo nunquam ne verbulo quidem ullo læsus aut perstrictus fuerit." (Scaligeri Epistolæ, p. 809. Lugd. Bat. 1627, 8vo.) George Thomson was born at St Andrews, and studied in the university of his native city. Here he took the degree of A. M. and was incorporated at Oxford on the 30th of August 1605. (Wood's Fasti Oxonienses, part i. col. 309. Bliss's edit.) He was appointed minister of the reformed church at Châtaigneraye in Poitou. His command of the French language, and his eloquence as a preacher, are celebrated by John Dunbar. (Epigrammaton centuriæ sex decades totidem, p. 191. Lond. 1616, 8vo.) Under the date of 1617, we find the following obituary notice by Robert Boyd: "Mr Thomson, pasteur de la Chaistaignoraye, demeurant à la laiterie en Poytou;

> Vidit homo frigere suæ miracula divæ,
> Crassaque pro calido stragula thure dedit.

The personal appearance of Lipsius presented nothing very striking or dignified. Le Mire, who abounds in rhetorical flourishes, is pleased to inform us that he had a divine twinkle in his eye; but he does not attempt to disguise the fact, that many of the strangers who came to visit him were not a little disappointed at the meanness of his aspect. He had an ample forehead, and was of an ordinary size and shape; but during the latter part of his life, his appearance was much affected by the diseased state of his liver. He lived in a plain style, and retained only one man servant, who likewise acted as his amanuensis. Nature had denied him all relish for music; but from his literary toils he found an agreeable relaxation in the cultivation of his garden, which was planted with a variety of flowers, and was particularly rich in tulips. His biographer has likewise thought it worthy of notice that he was always fond of dogs, and that during his last residence at Louvain he generally kept three, one of them being of a Scotish breed.

Lipsius was a great master of the Latin language and literature. He has evinced much critical skill, as well as much erudition, in illustrating many of the ancient authors, and many different branches of Roman antiquities. His lucubrations on the poets are not in general very felicitous, nor did his taste particularly qualify him for this department of classical criticism: of the style and scope of historians, philosophers, grammarians, and rhetoricians, he was a more competent judge. In the Greek language he was not eminently skilled; and he has occasionally treated of subjects which required that knowledge in which he was somewhat deficient. His treatise on the military affairs of the Romans is founded on the Greek text of Polybius, which he transcribes and expounds; but, according to the opinion of Casaubon, where that text was formerly obscure, he has left it without any new elucidation. It is another charge against the same work, urged by Scaliger and Salmasius,[1] and repeated by many later writers, that the materials are in a great measure stolen from the Italian treatise of Patrizi.[2] Nor is this the only occasion on which an accusation of downright plagiarism has been preferred against him: Muretus complained of his having appropriated some of his emendations on Tacitus; and Faber, in more indignant terms, averred that from his *Semestria* Lipsius had without acknowledgment borrowed the best part of the materials for his treatise on the gladiators. Torrentius and other writers had similar charges to prefer against him, nor is it easy to believe that these accusations were destitute of all foundation.[3]

The political writings of Lipsius possess little or no value, except as a mere collection of facts and quotations. Here he displays no liberality or enlargement of mind; and beyond the limits of classical erudition, he appears to have been a man of very slender judgment. His two treatises on the Stoic philosophy are however of more interest and importance. His taste in composition was singularly quaint and affected, nor does he seem to have retained the power of conveying any information in plain and direct terms. This vitiated mode of writing excited the disgust of some of his most learned contemporaries; and on the Latinity of Lipsius a volume of 560 pages was published by H. Stephanus.[4] A considerable portion of it is however occupied with considerations respecting a war with the Turks; and this, says Scaliger, appeared so ridiculous that some person proposed to entitle it "De Lipsii Latinitate *adversus Turcam*." "The style of Lipsius," says Dr Jortin, "is execrable, in his later compositions; for in his

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homme scavant, disert, joyeuse, entier, et d'un fort agréable conversation." (Bannatyne Miscellany, vol. i. p. 289.) Thomson is the author of a large volume entitled "La Chasse de la Beste Romaine: où est refuté le xxiii. chap. du Catechisme et Abregé des Controverses de nostre temps touchant la Religion Catholique, imprimé à Fontenay le Comte en l'an M.DC.VII. et est recerché et evidemment prouvé que le Pape est l'Antichrist. Par George Thomson, Pasteur de l'Eglise Reformée de la Chastegneraye." Rochelle, 1611, 8vo. Geneve, 1612, 8vo. Some copies of the second edition likewise bear Rochelle. Some passages of this elaborate work were attacked by René le Corvaisier, in "La Chasse au Loup Cervier, contre les Calomnies de G. Thomson." Paris, 1612, 8vo. Thomson strenuously defended himself in "La Desroute de la Chasse du Loup Cervier; ou, Refutation du Traicté du Ieusne, fait par Maistre René le Corvaisier, soi disant Theologien de la Faculté de Paris: contre quelques passages par lui attaqués en la Chasse de la Beste Romaine. Par George Thomson," &c. Rochelle, 1612, 8vo. Thomson had at an earlier period published a French version of Napier's commentary on the Revelation, under the subsequent title: "Ouverture de tous les Secrets de l'Apocalypse ou Revelation de S. Iean, par deux traités, l'un recerchant et prouvant la vraye interpretation d'icelle, l'autre appliquant au texte ceste interpretation paraphrastiquement et historiquement, par Iean Napeir (c. a. d.) Nonpareil, Sieur de Merchiston: reveue par lui-mesme, et mise en François par Georges Thomson Escossois." Rochelle, 1602, 4to. Rochelle, 1605, 8vo. Rochelle, 1607, 8vo. To the second edition he added "Quatre Harmonies sur la Revelation de S. Iean." His Latin poems are partly reprinted in the *Delitiæ Poetarum Scotorum*, tom. ii. p. 509-38.

[1] Scaligerana, p. 143. Salmasii Epistolæ, p. 213. Lugd. Bat. 1656, 4to.

[2] La Militia Romana di Polibio, di Tito Livio, e di Dionigi Alicarnaseo, da Francesco Patricii dichiarata, e con varie figure illustrata: la quale a pieno intesa, non solo darà altrui stupore de' suoi buoni ordini e disciplina, ma ancora, in paragone, farà chiaro quanto la moderna sia difettosa e imperfetta. Ferrara, 1583, 4to.

[3] Thomasii Dissertatio philosophica de Plagio Literario, § 115. 222. 487. Lipsiæ, 1673, 4to. Crenii de Furibus Librariis Dissertationes epistolicæ, p. 95. Lugd. Bat. 1716, 12mo.

[4] De Lipsii Latinitate (ut ipsimet antiquarii antiquarium Lipsii stylum indigitant) Palæstra I. Henr. Stephani, Parisiensis, nec Lipsiomimi, nec Lipsiomomi, nec Lipsiocolacis, multoque minus Lipsiomastigis, &c. Francofordii, 1595, 8vo.

youth he wrote far better, till he fell into a broken, incoherent, sententious, oracular, and figurative language, not through incapacity of doing better, but through an affected and vitiated taste. He had a few disciples, who imitated him, and wrote ten times worse than he, because they had not his learning, and his fancy, and vivacity; he was ingenious, and they were dull."[1] His Latinity has been zealously vindicated by Klotz, who was however a lover of paradoxes; nor is it very probable that his arguments have made much impression on any scholar of a genuine taste for classical composition.[2]

The epistles of Lipsius, amounting to the number of a thousand, occupy an entire volume in the collection of his works; and to this number a very large addition was afterwards made by Burman.[3] Many of them relate to topics of literature, and are very elaborate. On epistolary composition he has left a brief treatise, entitled "Epistolica Institutio." Another of his short tracts may likewise deserve to be mentioned, namely, "De Bibliothecis Syntagma," which relates to the libraries of ancient times. His only labour as a civilian is a collection of "Leges Regiæ et Leges Decemvirales," to which he has however added no illustrations. Of his critical treatises he published a collection under the title of "Justi Lipsii Opera omnia quæ ad Criticam spectant." Antv. 1585, 4to. Lugd. Bat. 1596, 8vo. An elegant edition of his works appeared with the subsequent title: "Justi Lipsii, V. C. Opera omnia, postremum ab ipso aucta et recensita: nunc primum copioso rerum indice illustrata." Antverpiæ, 1637, 4 tom. fol. A life of the author by Aubertus Miræus, or Aubert le Mire, and various panegyrics and defences, are inserted in the first volume. The collection of his works is sometimes described as consisting of six folio volumes; but this enumeration includes his edition of Tacitus and Velleius Paterculus, forming one volume, and his edition of Seneca the philosopher, forming another volume of the same size. Of his original works there is a more recent edition. Vesaliæ, 1675, 4 tom. 8vo. The third volume contains seven very slight tracts on Roman antiquities, which are not inserted in the folio edition, and which ought never to have been printed. Lipsius contributed brief annotations on Catullus, Tibullus, Propertius, Martial, the younger Pliny, Florus, Suetonius, and Valerius Maximus; but his reputation as an editor chiefly depends on his emendations and elucidations of Seneca, and more especially of Tacitus.[4] (x.)

LIQUEFACTION, an operation by which a solid body is reduced into a liquid by the action of heat.

LIQUID, a body which has the property of fluidity, as water, mercury.

Liquid, amongst grammarians, is a name applied to certain consonants which are opposed to mutes. Thus *l*, *m*, *n*, and *r*, are liquids.

LIQUOR, a name for any fluid substance of the aqueous or spirituous kind. The principal beverage amongst the Jews, as well as the Greeks and Romans, was water, milk, and the juices of various plants infused therein. For a long time, under the commonwealth of Rome, wine was so scarce, that in their sacrifices to the gods the libations were made with milk only. Wine did not become common there till the year 600 of the city, when vines began to be planted.

LIS, or Lys, John Vander, painter of history, landscapes, and conversations, was born at Oldenburg in 1570, but went to Haerlem to place himself as a disciple under Henry Goltzius; and as he was endowed with great natural talents, he soon distinguished himself in that school, and imitated the manner of his master with great success. He adhered to the same style till he went to Italy, where, having visited Venice and Rome, he studied the works of Titian, Tintoret, Paolo Veronese, and Domenico Fetti, so effectually, that he improved his taste and judgment, and altered his manner entirely. He soon received marks of public approbation; and his compositions became universally admired for their good expression, their lively natural colouring, and the sweetness and delicacy of his pencil; although it must be acknowledged that he could never totally divest himself of the ideas and taste peculiar to the Flemings. His subjects were usually histories taken from the sacred writings, or the representations of rural sports, marriages, balls, and villagers dancing, dressed in Venetian habits; all which he painted in a small as well as a large size, with a number of figures, well designed, and touched with a great deal of delicacy. He likewise painted naked figures admirably, with natural and elegant attitudes, and a very agreeable turn of the limbs. A capital picture of this master is, Adam and Eve lamenting the death of Abel, which is admired, not only for the expression, but also for the beauty of the landscape; and in the church of St Nicholas at Venice is another of his paintings, representing St Jerome in the desert, with a pen in his hand, and his head turned to look at an angel, who is supposed to be sounding the last trumpet. The colouring of this picture is rather too red; but it is designed in a fine style, and charmingly pencilled. The paintings of this master are very rarely to be purchased, He died in the year 1629.

Lis, *John Vander*, of Breda, an historical painter, was born at Breda about the year 1601, and became a disciple of Cornelius Polemburg, whose manner he imitated with extraordinary exactness, in the tint of his colouring, his neatness of pencilling, and the choice of his subjects. There are some paintings of this master which, though they appear to have somewhat less freedom and lightness of touch, are nearly equal to those of Polemburg, and are frequently taken to be his.

LISBON, a city of Portugal, the metropolis of that kingdom, as well as of the province of Estremadura, in which it is situated. It is built on the banks of the river Tagus, which is a most secure and capacious harbour, well defended, and capable of admitting 10,000 sail of vessels, without danger to them. The only difficulty is the bar at the entrance, which makes it hazardous either to enter or depart without the aid of skilful pilots. Between the bar and the city the strong castle of Belem, under whose guns all ships must pass, is a sufficient protection. Few finer objects can be seen than a panoramic view from the harbour of Lisbon. The smooth expanse of water studded with ships, the vineyards on the surrounding hills, interspersed with villas, and the magnificent city extending two miles along the shore, afford a coup d'œil which has few equals.

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[1] Jortin's Life of Erasmus, vol. i. p. 466.—Grotius entertained nearly the same opinion of his style: "Cum floridum ipsi et profluens natura haud abnegaret, alterum maluit dicendi genus, consisum quidem, nec sine festivitate, sed vere novum obtentu antiqui: quod cum imitarentur, quibus ingenii judiciique non idem fuit, ad corruptissima quæque deventum est." (Hist. de Rebus Belgicis, lib. v. p. 378.)

[2] Klotzii Opuscula varii argumenti, p. 1. Altenb. 1766, 8vo.

[3] Burmanni Sylloge Epistolarum, tom. i. ii. The correspondence of Lipsius occupies all the first volume, and 193 pages of the second.

[4] "Lipsii opera ita probata est viris intelligentibus, ut et *Sospitator Taciti* diceretur, et inter principes interpretum referretur." (Fabricii Bibliotheca Latina, tom. ii. p. 396. edit. Ernesti.) With the works of Tacitus he was so familiarly acquainted, that, according to the statement of De Rossi, he could repeat them from beginning to end. (Erythræi Pinacotheca tertia, p. 2.) This morsel must however be taken with a grain of salt.

Lisbon is a city of great antiquity; it was known in remote periods by the name Ulyssippo, and its origin attributed to Ulysses. It was a *municipium* under the Roman government, and one of the favourite cities under the Moorish yoke. It was regained from the African marauders in 1154, by Alphonso, who had a few years before assumed the regal power, and who was assisted by a fleet of adventurers bound on a crusade to the Holy Land. Since that period it has continued the metropolis of Portugal, an independent kingdom, except from the year 1580 to 1640, when it was united to the Spanish monarchy.

From the vicissitudes this city has experienced, we may expect to find it abounding in Phœnician, Roman, and Moorish antiquities; but the tremendous earthquake which it suffered in 1755 buried most of what then remained in a heap of ruins. After the dismal catastrophe of that period, the city rose again with unexampled rapidity, and with a beauty and splendour far exceeding its former condition. The traces of this calamity are not, however, wholly obliterated. Near the river, and the Praça di Commercio, large masses of ruined churches and convents are visible amongst the modern buildings; and the fractured strata of the rocks on which these stand, still show the nature of the concussion which destroyed the former city. This city seems exposed to this calamity, as there have been frequent shocks of earthquakes since; and indeed few years pass without some slight indications of a tendency in the earth to similar *tremblemens*. The streets of Lisbon are of competent breadth, and paved; but, owing to the inequality of the ground on which they stand, and their slippery state, they are uncomfortable to walk or ride through. The attention of a vigilant police is wanted to enforce a greater observance of cleanliness. As few of the Portuguese nobility reside on their estates, their residences within the city are very splendid; and some of the richer merchants have houses, which in appearance rival those of the higher orders; but the habitations of the lower classes of the inhabitants are miserable and disgusting by their excessive filthiness.

The public buildings are very spacious; and some of the few which sustained the concussion of 1755 exhibit fine specimens of ancient architecture. The church of Belem is one of these, and though two of the columns which supported the roof were then thrown down, and have since been replaced by two mis-shapen masses of modern masonry, it exhibits the finest specimen of the Arabesque-Gothic style of building. The royal palace is finely situated on the banks of the Tagus at Belem, but, being composed of wood, is not equal to the general taste of the other public buildings. The most imposing object near Lisbon is the aqueduct, which conveys fresh water to the city, and which in grandeur yields to no work of ancient or modern times. The cathedral is a large and magnificent building, and endowed with a revenue estimated at more than L.100,000 sterling annually.

Lisbon is enriched with such establishments as usually adorn the capitals of kingdoms. It possesses an academy of sciences, a botanic garden, a well arranged cabinet of natural history, some public libraries, amongst which that of the Regalia contains upwards of 80,000 volumes, a college for the nobles, and several other seminaries. Amongst other charitable institutions, is an hospital, where the sick of all countries are freely admitted and relieved.

The climate of Lisbon is remarkably salubrious, and is sought after by invalids from the more northern countries, for relief in pulmonary complaints. It is thought that the water drunk in this city has a tendency to alleviate these maladies. This water, which is brought from Montelavar by the aqueduct, is strongly impregnated with carbonate of lime, and, on analysis, is like the water of Clifton, but has a greater quantity of lime in a state of suspension.

The markets of Lisbon are most profusely supplied with every article that can administer to human appetite. The consumption of animal food is small, that of beef exceeding that of mutton in a very great degree; but, for the number of inhabitants, the quantity of animal food consumed in Lisbon is only one eighth of that which London requires to supply it. Fish, both from the sea and the rivers, is abundant and cheap. Fruit of every kind, and flour of excellent quality, are to be purchased; and garlic, which seems to be one of the articles in most extensive demand, is furnished in prodigious quantities.

Before the great earthquake of 1755, the city of Lisbon was calculated to contain 150,000 inhabitants; but, by the census taken in 1804, the number amounted to 240,000. The removal of the court to Brazil did not diminish the population, but it has since declined, so that in 1830, by the last census, there were only 200,000, which, indeed, was both increased and enriched by this city having been during the peninsular war the focal point through which communication with the army was maintained, and the depôt for the ammunition, provisions, and recruits, destined to support the forces employed in the interior of Spain and Portugal.

There are few people in Lisbon occupied in manufactures. Some fine woollen cloths are made, some linens, and a quantity of silk goods more than equal to that of both the others. The greatest taste of this city is displayed in its jewellery business, in which, though rather tawdry than elegant, they excel. The goldsmiths and silversmiths are excellent workmen. As a specimen of the best faculties exercised in that branch, it deserves to be noticed, that the splendid service of plate presented to the Duke of Wellington by the government of Portugal was wholly made in Lisbon; and no person was permitted to execute the least part of the work who was not a native of the kingdom. This service, both for value and for the exquisite workmanship, is the first collection that was ever seen, and far exceeds that of any royal household in Europe.

The foreign trade of Lisbon is second to no city in Europe excepting that of London. Its domestic productions, wine, oil, fruits, and bay salt, are conveyed to all the northern parts of the continent of Europe, but more especially to England, with which is the principal commerce. It receives in return from every country the articles in which it excels; from Russia, hemp, flax, and other naval stores; from the other parts in the Baltic Sea, linens, iron, steel, salted fish, timber, pitch, and tar; from Germany and Holland it obtains linens, corn, and some other commodities. England makes returns in cloths, linens, cotton, hardware, porcelain, and the various products of its looms, its forges, and its kilns. France supplies some linens, and the more fanciful articles of its tasteful industry. These varied commodities, received at Lisbon, are partly consumed in Portugal, whilst a very considerable proportion of them are destined for re-exportation to the transmarine settlements.

The commerce of Lisbon is considerable with the Portuguese establishments in China, in India, and on both sides of the continent of Africa. The latter consists principally of such articles as are required to be given in exchange for human beings, in that abominable traffic denominated the slave-trade, but which deserves to be stigmatized as the commerce of cruelty and the stimulus to murder and barbarism. Brazil furnished for a long period the great rudiments of the distant trade of Lisbon. Its sugars were distributed from hence to all the continental ports, where they obtained the name of the port at which they had first been received in Europe. The cotton from that country, before the recent encouragements to its growth had given birth to its present enormous production, all centred in Lisbon; and it was the entrepôt for the gold, the silver, and the precious stones which the mines of Brazil yielded.

The removal of the seat of the Portuguese government from the European metropolis to its American dominions, caused a great revolution in the commercial relations of both parts of the empire. Brazil, having quitted its colonial character, had its ports opened to the commercial ships of all nations; the transit trade of Lisbon was in some measure terminated; but the alteration communicated such a stimulus to Brazil, and its population, its wealth, and its productions, increased so much within the first ten years that elapsed after the emigration of the court, that, after allowing for what passed direct to and from Brazil in its intercourse with other countries, its transactions of commerce with Lisbon were as great as before the removal of the government.

We have no authentic accounts of the foreign imports and exports; but some judgment may be formed from the returns of the vessels that entered the port in the years, 1829, 1830, and 1831, as furnished by the British consul:—

Countries.	Ships in 1829.	Ships in 1830.	Ships in 1831.
British	322	294	230
Portuguese	320	242	131
Foreign	560	692	308
Total	1202	1228	669

The average number of vessels, and their tonnage, which belonged to the port of Lisbon in the same three years, was, by the consular report, sixty ships, and of 9090 tons burden.

Lisbon is situated in north latitude 38. 42. 20., and west longitude from London 8. 37. 25., as determined by trigonometrical observations.

LISBURN, a town of Ireland, in the county of Antrim, situated on the western bank of the river Lagan, about seven miles south-south-west of Belfast. It is a large and busy town, being the second in commercial importance in the county. The manufacture of linen, muslin, and cambric, is carried on to a considerable extent. The principal public buildings are, a fine church, a market-house, an infirmary, a catholic chapel, and several dissenting places of worship. It was destroyed by fire in 1707, and rebuilt in its present form. It returns a member to parliament. It contains a population of 6201.

LISIEUX, an arrondissement of the department of Calvados, in France, extending over 339 square miles, and inhabited by 69,500 persons. It is divided into five cantons, and these into 142 communes. The capital is the city of that name situated at the junction of the two rivers Toques and Orbec. It was formerly fortified, but the ramparts have been converted into elegant promenades. It contains 1700 houses, and 11,500 inhabitants, who are employed in the woollen manufacture, and also, but to a greater extent, in making linen of a superior quality, known as *toiles crétonnes* through France. It is particularly celebrated for its bleaching and its dyeing. Long. 0. 10. E. Lat. 49. 11. N.

LISLE, or LILLE, an arrondissement of the department of the North, in France. It extends over 356 square miles, is divided into sixteen cantons, and subdivided into 129 communes, which together contain 241,800 inhabitants. The capital is the city of the same name, the most celebrated fortified place in Europe, and in the most fertile district of France. It is situated on the river Deule, which is navigable for barges and other small craft. The streets are broader than is usual in fortified places, and the new part of the city is handsome. Some of the public buildings, especially the theatre, the exchange, the barracks, and St Stephen's church, are fine. It contains 11,500 houses, and 62,500 inhabitants, who are occupied in numerous manufactures, though most of them are on a small scale. The most important are sugar-refining, glass-making, weaving linen, cotton, and woollen goods. The spinning of lace, and making of thread, employs many hands, as does the fabrication of pillow-lace. A vast quantity of seed-oil and of oil-cake is also made, both for domestic use and for exportation. Long. 2. 59. 11. E. Lat. 50. 37. 50. N.

LISLE, *Joseph Nicholas de*, an eminent astronomer and geographer, was born at Paris in the year 1688. His father having taught him the principles of grammar, he afterwards attended lectures in Mazarin College, where he delivered rhetorical exercises in the year 1706. A total eclipse of the sun having taken place on the 12th of March in that year, his taste for mathematics was thus discovered, and he was accordingly placed under a proper tutor, who taught him the elements of geometry, fortification, and mechanics; but his favourite study was the science of astronomy.

In 1707, he obtained the place of engineer at Martinico, which made him acquainted with the art of drawing; an acquisition which proved highly useful to him in his geographical labours, and also in the study of astronomy. His father having procured a copy of an Account of a Voyage to the South Sea, from his son's master, young De Lisle was excited by the perusal of it to the study of natural history, and began to make collections of insects, and sketch their varieties; but being afterwards persuaded that a study requiring such immense collections to be made as he found in Aldrovandus, was wholly incompatible with the unremitting attention which his favourite science required, he relinquished it entirely. The attention he paid to astronomical researches was so great, that he was considered as meriting the correspondence of some of the ablest astronomers of Europe at the early age of twenty-one. In 1709 he made a wooden quadrant, which he divided with the utmost accuracy, and which answered the intended purpose in his early observations. He likewise constructed a table for Cassini, of the right ascensions and declinations, adapted to all the degrees of latitude and longitude of the planets, and the obliquity of the ecliptic; and this table was made use of by Cassini in foretelling the occultations of the stars by the moon.

De Lisle being informed by Cassini in 1710 of his method of representing an eclipse of the sun, by the projection of a terrestrial parallel on a plane, he instantly conceived the idea of applying it to every part of the earth, by means of a globe mounted and prepared for that purpose. Such astronomers as he made acquainted with his project conceived it to be impracticable; but when the machine was completed, they bestowed the highest encomiums on the noble invention. The first memorable observation made by De Lisle was that of the moon, on the 23d of January 1712, after which his labours experienced some interruption from indisposition. About this time the situation of his father's numerous family rendered it necessary that he should provide for himself, so that he was obliged to make his astronomical knowledge subservient to the absurdities of astrology, receiving pecuniary presents from the regent for his services. He also received, in 1715, the grant of a pension of six hundred livres, on which occasion he calculated tables of the moon according to the Newtonian theory, prior to Halley's communications to him, which were printed in 1719. De Lisle was chosen a member of the Academy of Sciences in 1714.

In 1720 he delivered a proposal to the academy for ascertaining in France the figure of the earth, a design which was carried into execution some years afterwards. In 1723 he delivered to the same body a memoir on the transits of Mercury, wherein a method of calculating them was proposed by him, as well as the way in which they were to be observed, and the inferences to be deduced from these observations. He proposed the use of the quadrant in observing the transits of Venus and Mercury, which has been found superior to any other instrument for that important purpose, and is sanctioned since his day by the practice of the ablest astronomers.

De Lisle visited England in the year 1724, and there became acquainted with Newton and Halley, and had the honour of obtaining their approbation. Newton made him a present of his own portrait, and Halley gave him a copy of the tables which he had published in 1719. He was also created a member of the Royal Society, and enjoyed similar honours from every literary society in Europe before his death. In 1721 he received an invitation from Peter the Great to go to St Petersburg to fill the chair of astronomer in the Imperial Academy of Sciences. Upon the death of that emperor, his successor Catharine renewed the invitation, at the same time offering him a considerable pension, which he accepted, and, in 1726, set out for St Petersburg, accompanied by his brother Louis and M. Vignon, who were to act as his assistants. He reached St Petersburg in the month of October, and was established in the observatory erected by Peter the Great, which he occupied for twenty-one years. It was in every respect commodious, but extremely deficient in astronomical apparatus, which his own ingenuity and indefatigable application in a great measure supplied.

A transit of Mercury over the sun's disc was expected in the year 1740, which would not be visible in Europe, and therefore De Lisle undertook a journey to the distant regions of Asia; but after travelling through the inhospitable wilds of Siberia, the cloudiness of the atmosphere prevented him from observing the transit; a mortification which he endeavoured to support by his geographical and physical remarks, and in drawing up a description of the country. He constructed an interesting map of Russia, assisted by his brother Louis, who was appointed to make observations in the most distant parts of that immense empire. He was occasionally employed for the long period of forty years in making meteorological observations, which he executed with an accuracy almost incredible.

After a number of discouragements and difficulties, and the irregular payment of his pension, had been long experienced by De Lisle at St Petersburg, he returned disgusted to his native place, and was chosen professor of mathematics at the Royal College, where he rendered the most essential service to the sciences, by the important instructions which he gave to his numerous pupils, many of whom became afterwards the most distinguished characters, such as MM. de Lalande and Messier.

When the transit of Mercury over the sun was eagerly expected in 1753 by the greatest astronomers, De Lisle published an interesting map of the world, representing the effect of Mercury's parallaxes in different countries, that those places might be known which were proper for making such observations on the transit as might determine the distance of the sun. As the apparent orbit of the planet traversed nearly the centre of the sun, De Lisle made use of this circumstance to determine the diameter of that luminary. The last work of our author which was inserted in the volumes of the French Academy was a memoir on the comet which appeared in the year 1758, discovered by a peasant in the vicinity of Dresden.

It may perhaps be asserted with justice, that the most important service which he rendered to astronomers was the correction of the double error of Halley respecting the transit of Venus, looked for in the year 1761, as by this means he prevented many learned men from undertaking long voyages in order to observe it. About the year 1754, De Lisle was appointed by the king of France astronomical geographer to the marine, in which capacity he was employed to collect plans and journals of naval captains, to arrange them methodically, and to make extracts from them of whatever might be beneficial to the service. About the year 1758 he withdrew into retirement at the abbey of St Geneviève, where much of his time was spent in devotional exercises, and in acts of charity and beneficence. Still, however, he continued to prosecute those studies which had been so dear to him during the earlier part of his life. In 1768, he was seized with a scorbutic complaint, of which he was cured by his medical friends; but in the month of September of the same year he was seized with a species of apoplexy, which carried him off on the 11th of that month, in the eighty-first year of his age.

His extraordinary merit as a man of science may in some measure be gathered from this concise account of his life; and, as a citizen of the world, his piety was unaffected, his morals pure, his integrity undeviating, his spirit generous and disinterested, and his whole manners highly amiable. The only publication of his, besides those already mentioned, consisted of Memoirs illustrative of the History of Astronomy, in two vols. 4to.

LISMORE, one of the Hebrides, or Western Islands of Scotland, belonging to Argyleshire, situated at the mouth of Loch Linnhe, about nine miles in length, and from one to two in breadth. The surface is hilly and uneven; but the soil is fertile, and yields a sufficient quantity of grain for the support of the inhabitants; oats, barley, potatoes, and flax being the articles of crop generally cultivated. The whole island lies upon a rock of limestone, which article is exported in considerable quantities. In the lakes there are strata of marl found varying from ten to sixteen feet in depth. It was anciently the residence of the bishops of Argyle, and contained, until very recently, a Roman Catholic college for the education of the clergy of that persuasion in this part of the country. The ruins of an old castle are still to be seen, and in several places vestiges of fortified camps. The population amounted in 1831 to 1790.

LISMORE, a town of Ireland, in the county of Waterford, situated on the southern bank of the Blackwater, about twenty-six miles north-east of Cork. It was formerly a considerable city, being the see of a bishop, but has been often destroyed by fire, and is now a small, mean place. It possesses a small cathedral, and a castle situated on the verge of a rock which rises perpendicularly over the river. It has no manufacture of any kind, the inhabitants being principally engaged in agricultural pursuits.

LISSA, an island in the Adriatic Sea, being a part of the Austrian province of Dalmatia. It is fifty-seven square miles in extent, and contains 4557 inhabitants. Although it is mountainous, it is very productive in wine, oil, honey, figs, almonds, and silk, but deficient in corn. There are large flocks of sheep yielding excellent wool, and many goats, and upon the coast there are large fisheries. The chief town, of the same name, is on a convenient harbour, and contains, including the two adjoining hamlets of Banca, 2676 inhabitants. It is situated on the spot where formerly stood the celebrated city of Issa, noticed by Strabo.

LISSA, a city of Polish Prussia, in the government of Posen, and circle of Fraustadt. It is situated on the frontier towards Silesia, is a well-built city, in a sandy district. It contains two churches of Calvinists, one of Lutherans, and one of Catholics, two hospitals, 780 houses, with 7954 inhabitants, of whom 3640 are Jews. It enjoys considerable trade, chiefly carried on by the Jews, who make linen, woollen, and other goods. Long. 16. 32. 20. E. Lat. 51. 51. 55. N.

LIST, in commerce, the border of cloths or stuffs, serving not only to show their quality, but to preserve them from being torn in the operations of fulling, dyeing, &c. List is used on various occasions, but chiefly by gardeners for securing their wall trees.

List is also used to signify the enclosed field or ground wherein the ancient knights held their jousts and combats. It was so called, as being hemmed round with pales, barriers, or stakes, as with a list. Some of these were double, one for each cavalier, which kept them apart, so that they could not come nearer each other than within a spear's length.

Civil List, in the British polity. The expenses defrayed by the civil list are those which in any shape relate to civil government, as the expenses of the household; all salaries to officers of state, to the judges, and every one of the king's servants; the king's private expenses, or privy purse; and other very numerous outgoings. The civil list is indeed properly the whole of the king's revenue in his own distinct capacity; the rest being rather the revenue of the public or its creditors, though collected and distributed again in the name and by the officers of the crown. It now stands in the same place as the hereditary income did formerly; and as that has gradually diminished, the parliamentary appointments have increased. See England.

LISTER, Martin, an eminent English physician and naturalist, was born in 1638, and educated at Cambridge. He afterwards travelled into France, and on his return practised physic at York, and afterwards at London. In 1683, he was created doctor of physic, and became fellow of the College of Physicians in London. In 1698, he attended the Earl of Portland in his embassy from King William III. to the court of France (of which journey he published an account on his return), and was afterwards physician to Queen Anne. He also published, 1. *Historia Animalium Angliæ*, 4to; 2. *Conchyliorum Synopsis*, folio; 3. *Cochlearum et limachum exercitatio anatomica*, in four vols. 8vo; 4. Many pieces in the Philosophical Transactions; and other works.

LITANY, a solemn form of supplication to God, in which the priest utters some things fit to be prayed for, and the people join in their intercession, saying *we beseech thee to hear us, good Lord.* The word comes from the Greek λιτανεια, *supplication*, from λιτανευω, *I beseech.*

At first the use of litanies was not fixed to any stated time, but they were only employed as exigencies required. They were observed, in imitation of the Ninevites, with ardent supplications and fastings, to avert the threatening judgments of fire, earthquakes, inundations, or hostile invasions. About the year 400, litanies began to be used in processions, the people walking barefoot, and repeating them with great devotion; and it is pretended, that by this means several countries were delivered from great calamities. The days upon which these were used were called *rogation days.* These were appointed by the canons of different councils, till it was decreed by the council of Toledo that they should be employed every month throughout the year; and thus by degrees they came to be used weekly on Wednesdays and Fridays, the ancient stationary days for fasting. To these days the rubric of the episcopal church has added Sundays, as being the greatest days for assembling at divine service. Before the last review of the common prayer, the litany was a distinct service by itself, and performed some time after the morning prayer was over; at present it is made one office with the morning service, being ordered to be read after the third collect for grace, instead of the intercessional prayers in the daily service.

LITCHFIELD, a city in the hundred of Offlow, in Staffordshire, situated upon a branch of the river Trent, 119 miles from London by Coventry, and 124 by Northampton. It has been an episcopal city almost from the introduction of Christianity into this island; and the cathedral is said to have been first built in the year 300. It is a fine building, walled in like a castle, and, from its elevated situation, a prominent object over a great extent of country. A spire rises from the centre, 256 feet in height; and at the west end are two towers, terminating also in spires. This city was for a short period in the eighth century made the see of an archbishop; but was soon afterwards reduced again to a bishopric. In the year 1072, it was removed to Chester, and in 1102 to Coventry, and united to that see. The cathedral is a fine piece of architecture, and the interior is adorned with some marble monuments, particularly those of Dr Johnson and Mr Garrick, both natives of the city. The government is executed by a corporation consisting of two bailiffs and twenty-four burgesses, and sends, as before the passing of the reform act, two members to parliament. It is a county, with exempt jurisdiction. There is little trade, except what is internally carried on upon the canals. It has markets on Tuesdays and Fridays. The population amounted in 1801 to 4712, in 1811 to 5022, in 1821 to 6075, and in 1831 to 6723.

Litchfield, a county of Connecticut, United States, bounded on the north by Massachusetts, on the east by Hartford, on the south-east by New Haven, on the south-west by Fairfield, and on the west by New York. The face of the country is rough and mountainous; but the soil is good, yielding excellent crops of wheat and Indian corn, and affording fine pasturage. From the inland situation of the county, no maritime commerce can be carried on, and the inhabitants are almost wholly engaged in agricultural and manufacturing pursuits. The population amounted in 1830 to 42,855.

Litchfield, the capital of the above county, a post-town, situated about thirty miles west of Hartford, and thirty-one north-north-west of New Haven. The situation is elevated, and affords a beautiful and extensive prospect of the surrounding country. The town contains a court-house, a jail, a female academy, a law-school, a printing establishment, a bank, and nine places of worship. It is a good agricultural town, and possesses numerous mills and manufacturing establishments, cotton manufactories, iron-works, &c. Long. 73. 37. W. Lat. 41. 50. N. The population amounted in 1830 to 4456.

LITERARY, any thing belonging to literature.

Literary Property, or *Copyright.* See Copyright.

LITERATI (*letrados*, lettered), an epithet given to such persons amongst the Chinese as are able to read and write their own language. The literati alone are capable of being made mandarins. Literati is also the name of a particular sect, either in religion, philosophy, or politics, consisting principally of the learned men of that country, amongst whom it is called *jukiao*, or learned. It had its rise in the year of Christ 1400, when the emperor, to awaken the native affection of the people for knowledge, which had been quite banished by the preceding civil wars, and to stir up emulation amongst the mandarins, selected forty-two of the ablest of the doctors, to whom he gave a commission to compose a body of doctrine agreeable to that of the ancients, which was then become the rule or standard of the learned. The delegates applied themselves to the business with very great attention; but some fancied them rather to have wrested the doctrine of the ancients to make it consist with their own, than to have built up theirs upon the model of the ancients. They speak of the Deity as if that being were no more than mere nature, or the natural power or virtue that produces, disposes, and preserves the several parts of the universe. He is, say they, a pure, perfect principle, without beginning or end;

the source of all things, the essence of every being, and that which determines it to be what it is. They make God the soul of the world; they say he is diffused throughout all matter, and produces all the changes which occur in it. In short, it is not easy to determine whether they resolve God into nature, or lift up nature into God; for they ascribe to it many of those things which we attribute to the Deity. This doctrinc introduced a refined kind of atheism, instead of the idolatry which prevailed before. The work, being composed by so many persons of learning and parts, and approved by the emperor himself, was received with infinite applause by all the people. Many were pleased with it, because it seemed to subvert all religion; others approved of it, because the little religion that it left them could not give them much trouble. And thus was formed the sect of the literati, consisting of the maintainers and adherents to this doctrine. The court, the mandarins, and the persons of fortune and quality, and others, are generally amongst its adherents; but a great part of the common people still hold to their worship of idols. The literati freely tolerate the Mahommedans, because they adore, with them, the king of heaven, and author of nature; but they entertain a perfect aversion to all sorts of idolaters, and it was once resolved to extirpate them. The disorder this would have occasioned in the empire prevented it; and they now content themselves with condemning them, in general, as heresies, which they do solemnly every year at Pekin.

LITHARGE, a preparation of lead, usually in form of soft flakes, of a yellowish-red colour. If calcined lead be urged with a hasty fire, it melts into the appearance of oil, and on cooling concretes into litharge. The greater part of the litharge met with in the shops is produced in the purification of silver from lead, and the refining of gold and silver by means of this metal. According to the degree of fire and other circumstances, it proves of a pale or deep colour. The first has been commonly called *litharge of silver*, the other *litharge of gold.*

LITHGOW, William, a Scotchman, whose sufferings by imprisonment and torture at Malaga, and whose travels on foot over Europe, Asia, and Africa, seem to raise him almost to the rank of a martyr and a hero. He published an account of his peregrinations and adventures. Though the author deals much in the marvellous, the account of the strange cruelties which he gives us has yet an air of truth. Soon after his arrival in England from Malaga, he was carried to Theobald's upon a feather-bed, that King James might be an eye-witness of his "martyred anatomy," by which he means his wretched body, mangled, and reduced to a skeleton. The whole court crowded to see him, and his majesty ordered him to be taken care of, and he was twice sent to Bath at his expense. By the king's command he applied to Gondomar, the Spanish ambassador, for the recovery of the money and other things of value which the governor of Malaga had taken from him, and for L.1000 for his support. He was promised a full reparation for the damage he had sustained; but the perfidious minister never performed his promise. When he was upon the point of leaving England, Lithgow upbraided him with the breach of his word, in the presence-chamber, before several gentlemen of the court. This occasioned their fighting upon the spot; and the ambassador, as the traveller oddly expresses it, had his fistula, with which disorder he was afflicted, contrabanded with his fist. The unfortunate Lithgow, who was generally condemned for his spirited behaviour, was sent to the Marshalsea, where he continued a prisoner during nine months. At the conclusion of the octavo edition of his *Travels,* he informs us, that in his three voyages, "his painful feet have traced over, besides passages of seas and rivers, 36,000 and odd miles, which draweth near to twice the circumference of the whole earth." Here the marvellous seems to rise to the incredible, and to place him, in point of veracity, below Coryat, whom it is nevertheless certain that he far outwalked. His description of Ireland is whimsical and curious. This, together with the narrative of his sufferings, is reprinted in Morgan's *Phœnix Britannicus.*

LITHOGRAPHY.

Lithography is the art of taking impressions from drawings or writings made on *stone.*

The principles upon which this art is founded are, 1*st,* The quality which a compact granular limestone has of imbibing grease or moisture; and, 2*dly,* The decided antipathy of grease and water for each other.

A drawing being made upon the stone with an ink or crayon of a greasy composition, is washed over with water, which sinks into all the parts of the stone not defended by the drawing. A cylindrical roller, charged with printing-ink, is then passed all over the stone, and the drawing receives the ink, whilst the water defends the other parts of the stone from it on account of its greasy nature.

This process, therefore, depends entirely upon chemical principles, and is thus distinct from letter-press or copperplate printing, which are altogether mechanical. On this account it has in Germany been called *chemical printing;* and, as metallic plates can be prepared to be printed from in a similar manner, lithography is considered only as a branch of chemical printing.

I. HISTORY OF LITHOGRAPHY.

History of the art.

The invention of lithography was the result of accident. Its inventor, Alois Senefelder, the son of a performer at the theatre-royal of Munich, was placed for education at the university of Ingolstadt, as a student of jurisprudence; but after his father's death he attempted a theatrical career. Not succeeding in this, he became an author, though his poverty prevented him from publishing his works. He now tried many plans with copperplates and compositions, as substitutes for letter-press, in order to be his own printer. He found, in the course of his experiments, that a composition of soap, wax, and lamp-black, formed a good material for writing on his plates; that, when dry, it became firm and solid, and that it resisted aquafortis. Wanting facility in writing backwards on the plates, he got some pieces of Kilheim stone, as cheap materials, upon which he could practise after polishing their surfaces. One day being desired by his mother to take an account of some linen about to be sent to be washed, and having no paper at hand, he wrote the account on a polished stone, with his composition ink, intending to copy it at his leisure. When he was afterwards about to efface this writing, it occurred to him that he might obtain impressions from it; and, having eaten away the stone with acid for about the hundredth of an inch, he found that he could charge the lines with printing ink, and take successive impressions. This new mode of printing appeared to him very important, and he persevered through all difficulties in applying his discovery to practical purposes, and in improving it.

In the course of many experiments, he found that it was not necessary to have the letters raised above the surface of the stone, but that the chemical principles by which grease and water are kept from uniting, were alone sufficient for his purpose. This point obtained, lithography may be said to have been fully discovered. All that was required was the improvement of the materials, and the mode of working with them, and the construction of a proper press for taking the impressions.

The perseverance with which he followed up his experiments, in order to overcome the difficulties which successively arose in his progress, is astonishing, and the more so, considering the total want of method in his proceedings. Often did he waste months in surmounting a difficulty which a little knowledge, or a very little reasoning, would have enabled him to conquer immediately. His uniform plan seems to have been, to try the first thing that came to hand, and so on in succession, till chance rewarded his assiduity by presenting to him the material suited to his purpose.

The first essays he made to print for publication were some pieces of music, executed in 1796; but afterwards he attempted drawings and writings. The difficulty he had in writing backwards led him to the process of *transfer;* and the use of dry soap, which was found to leave permanent traces that would give impressions, naturally led to the mode of chalk drawings.

Having made considerable improvements, Mr Senefelder obtained, in 1799, a patent privilege for Bavaria, when he made known his process, and afterwards entered into partnership with Mr André of Offenbach, who proposed to establish presses, and take out patents at London, Paris, and Vienna. For this purpose Senefelder came to London with a brother of André's, and the invention having been much spoken of, under the name of *Polyautography*, most of the principal English artists made trials of it. Unfortunately, however, the art of printing from the stones was not then fully understood, and the difference between the materials of Germany and those of England, used both for the purposes of drawing and printing, caused constant failures, and the artists in succession abandoned the practice of it. To this cause is to be attributed the slow progress which lithography made for many years in England, as it was left entirely in the hands of *amateurs*, whose productions, generally speaking, did no credit to the art, and whose faults were in some degree supposed to be those of the art itself.

In August 1800, Senefelder, who had now separated from André, went to Vienna, where, after much difficulty, a patent was obtained, and extensive preparations were made, for applying his process to print cottons; but bad management, and some unfortunate circumstances, prevented his success, and he returned to Munich in 1806, leaving the establishment in other hands.

In 1806, Mr Mitterer, professor of drawing at the public school at Munich, practised lithography to multiply copies for the pupils, and is said to have invented the chalk composition in its present form, or at least to have improved it greatly.

From this period, the practice of the art has extended and improved rapidly, and more particularly at Munich, where several establishments were formed for the purpose of applying it to the fine arts, as well as for printing writings and official forms for the different departments of the government.

In October 1809, Senefelder was appointed inspector of the royal lithographic establishment at Munich, for printing from stone a complete map and survey of Bavaria; after which period he devoted his time to experiments, and to writing the history of his invention. Among other points of improvement to which his attention was directed, was a substitute for the stones, which are inconvenient to use on account of their weight; and they are also liable to break in the press, when used without due caution, or when they contain flaws. For this purpose he made a composition of drying oil, finely ground earth, and other substances, which was thinly spread over pieces of parchment; but nothing of this sort has hitherto been found to answer. The surface cracks after repeated wetting and exposure to the power of the press, and the printing ink then enters the cracks, and spoils the impressions. Thus a very small number only of good impressions can be obtained. A public exhibition of printing from this stone paper was made in London, on the 23d July 1821, by a partner of Mr Senefelder; but the result was not such as to induce much confidence in the ultimate success of the trials to form this desirable substitute of a light material for a heavy one.

In England lithography was never entirely given up from its first introduction in 1800, although it was but little practised after 1806, till its revival at the latter end of 1817. Since then it has been most sedulously cultivated, and with such success, that its importance as a branch of trade is now almost equal to the art of engraving.

In France but little was done in lithography till 1815, when it was established at Paris by Lasteyrie, and being taken up by good artists, it soon attained great excellence.

Since this period it has extended most rapidly, and there is not now a town of any importance, either in Europe, North America, or in the East or West Indies, where lithography is not practised.

II. DESCRIPTION OF THE MATERIALS, AND THE MODE OF PREPARING THEM.

1. *Of the Stones, and the manner in which they are prepared to receive the Drawings.*

Stones.

As calcareous stones will all imbibe grease and moisture, and effervesce with an acid (the use of which will appear when we speak of the process of printing), they are all capable of being used for lithography. Those are best adapted to the purpose which are very compact, of a fine and equal grain, and free from veins, or imbedded fossils or crystals.

The quarries of Solenhofen, near Pappenheim, in Bavaria, furnished the first plates, and none have as yet been found to equal them in quality. They are of a very uniform pale yellowish-white colour. The fracture is perfectly conchoidal. The beds divide into thin portions of considerable size, with perfectly flat surfaces, and were on this account carried to Munich, and other places, for paving kitchens and halls, and thus came in the way of Senefelder, when he discovered the chemical process of printing.

The stones of this quarry vary in their quality, but the best may be had in great abundance. Generally speaking, the hardest are the best, provided they are quite uniform in texture. Such are necessary for fine chalk drawings; softer ones may do for ink, or for coarser drawings in chalk.

In France, stones have been found near Chateauroux (*Departement de l'Indre*), of a similar colour to those of Solenhofen, and even harder and of a finer grain; but they are so full of large spots of a softer nature, that it is scarcely possible to get one perfect of a greater size than twelve inches square.

In England, a stone has been used for lithography which is found at Corston, near Bath. It is one of the white lias beds, but not so fine in grain, or so close in texture, as the German stone, and therefore far inferior. But it is good for transfers, and does tolerably well for ink drawings or writings. Another stone, found near Stony Stratford, is also used; but it is of a brownish-gray tint, and too dark in colour to show the effect of the drawing with sufficient clearness.

To bear the pressure used in taking the impressions, a stone twelve inches square should be at least an inch and a quarter thick. The thickness must increase with the size of the stone, but two inches and a half are a thickness sufficient for stones of three feet by three feet and a half.

The stones, when sawn to a proper size and thickness, are ground level by rubbing two of them face to face with water and sand, and very carefully examined with a straight-edge, to ascertain that they are perfectly level in all directions. This applies only to the side which is afterwards to receive the drawing, as the natural division of the stone is sufficiently true for the back.

To prepare them for chalk-drawings, two stones, which have been perfectly levelled, are well washed, in order to free them from any of the coarser grains of sand which have been previously used upon them. They are now to be placed on a board over a trough, and a small quantity of water and fine sand being strewed over the surfaces, they are to be rubbed face to face, adding occasionally a little fresh sand and water. The best sort of sand in England is that called silver sand for preparing the stone, and the common brown sand for giving a fine grain. The sands must be passed through a sieve of the fineness required, which will vary with the nature of the drawing; and the greatest care must be taken to have the sieves perfect, and to prevent any coarser particles of sand from being mixed with the rest. A single grain would fill the stone with innumerable scratches, which would all appear in the drawing. The upper stone is in this operation moved in small circles carefully and equally all over the under one, taking care not to move the one beyond the edge of the other, or the faces would become rounded. When the grain is equal, and sufficiently fine, the stones are carefully washed, and wiped with a clean cloth. The stone, thus prepared, should have, when dry, a perfectly uniform appearance in the colour and grain, and resemble a sheet of vellum. It should be free from scratches, and have no shining parts. The upper stone is always the finer grained of the two.

To prepare the stones for ink drawings or writings, the process just described is first followed; they are then well washed to get rid of the sand, and the same operation of rubbing two together is continued with powdered pumice-stone and water. When perfectly smooth, they are again washed, and afterwards separately polished with a large piece of fine pumice-stone, or Water of Ayr stone. The polish now given to the stone should be such as to show the reflection of objects to the eye placed close to the stone, and looking along it towards the light.

When a writing or drawing has been fully used, and the stone is to be again prepared, sand is strewed over the surface, and it is sprinkled with water, and rubbed with another stone, as before described, till all traces of the drawing has disappeared. After this, the stone is again prepared for a new drawing with fine sand, by being grained or polished, as before.

Ink drawings sink deeper into the stone than the chalk, and require the stone to be more ground away to efface them. The longer drawings remain upon the stone, the deeper the ink or the chalk penetrates.

2. *Lithographic Ink and Chalk.*

For these materials, the union of several qualities is required; and as no single substance possesses them all, it is necessary to combine several substances together.

Lithographic Ink.

Ink.

The qualities required in lithographic ink, by which is meant the ink for drawing on stone, are, first, that it shall have in its composition such a quantity of greasy or fatty matter as will secure its imparting to the stone, even when it is laid on in the most delicate lines, a trace strong enough to attract readily the ink afterwards to be applied by the roller; and, secondly, that this grease be so prepared, by being mixed with alkali and other substances, as to be easily soluble in water, and to flow readily from the pen or brush when used for drawing. Many receipts have been given for this purpose, but the following is one of the most approved; and, ordinary care being taken in its preparation, it will be found to answer.

Composition of Lithographic Ink for drawing on Stone.

Tallow candle	2 oz.
Virgin wax	2 oz.
Shell lac	2 oz.
Common soap	2 oz.
Lamp black, about one twentieth of the whole.	

These materials are prepared in an iron saucepan, with a cover. The wax and tallow are first put in and heated till they ignite; whilst they are burning, the soap must be thrown in in small pieces, one at a time, taking care that the first is melted before a second is put in. When all the soap is melted, the ingredients are allowed to continue burning till they are reduced one third in volume. The shell lac is now added, and as soon as it is melted, the flame must be extinguished. It is often necessary, in the course of the operation, to extinguish the flame, and take the saucepan from the fire, to prevent the contents from boiling over; but if, after the process above described, any parts are not completely melted, they must be dissolved over the fire without being again ignited.

Sometimes a larger proportion of wax is used, when only half of the soap is put in, and the burning goes on until the quantity is reduced one half. The remainder of the soap is then added over a fire which keeps the mass melted without igniting it.

The black, being previously mixed with thick varnish, such as will be described when we come to treat of printing inks, should now be added; and when it is completely dissolved, the whole mass should be cast on a marble slab, and a heavy weight laid over it, to render its texture fine. When cold, though not so hard, it should in its fracture have an appearance resembling Indian ink.

So much here depends upon the manipulation, that even the most experienced person can never be sure that the desired result is altogether attained, until the product is subjected to experiments; the mass may have been burned a little more or a little less than enough; too much or too little time may have been allowed to elapse betwixt the putting in of one ingredient and another: such circumstances, trifling as they appear, are quite sufficient to render the ink altogether unfit for use. It not unfrequently happens, therefore, that such faults as the following are to be found: If it has been too little burned, it may appear soft, and, if soluble, it may, when mixed with water, speedily become thick and slimy, in which case it must be re-melted and burned a little more; but if, on the other hand, it has been burned too much, it may appear to be composed of sand, and, when used, although it will flow pleasantly enough, may not have enough of grease left in it to attract the printing ink when applied. This fault may be corrected by remelting it, and adding a small quantity of soap and wax.

Keeping in view the principles here pointed out, any one can, after a few trials, make good lithographic ink.

Ink for Transfers.

This ink may be composed of the same materials as the ink for drawing on stone, with the addition of a little more wax. If it is too little burned, the lines of the writing or drawing will spread on being transferred to the stone; if too much, a sufficient quantity of grease will not be imparted to the stone to attract the ink from the roller when it is applied: but either of these defects may be corrected as before directed.

Lithographic Chalk.

Cha. This should have the qualities of a good drawing crayon; it should be even in texture, and carry a good point. It is, however, difficult to avoid making it too soft and greasy on the one hand, and too brittle on the other. For the chalk, as for the ink, more or less of the soap, wax, and tallow may be used, as the extent of the burning may render necessary; and the remedies pointed out for defects of the ink will enable the operator to judge of what is wanting.

The following proportions are the best:

Common soap	1½ oz.
Tallow	2 oz.
Virgin wax	2½ oz.
Shell lac	1 oz.

The manipulation is similar to that for the ink. It is well, however, to throw in a little of the wax just before the flame is extinguished. Less black must be mixed with the chalk than with the ink, its only use being to colour the drawing, so that the artist may see the lines he traces.

When the whole is well mixed, it should be poured into a mould, and very strongly pressed to prevent any bubbles, which would make the texture irregular.

3. *Mode of Drawing.*

Drawing. With these materials the artist proceeds to work on the prepared stone, taking care first to wipe the stone with a clean dry cloth. The ink being rubbed with warm water like Indian ink, is used on the *polished* stone; and it is to be observed, that a gradation of tints can be obtained only by varying the thickness of the lines, and the distance at which they are placed apart, as the line traced by the ink, being sound and unbroken throughout, receives the printing ink all over. Hence it follows, that the artist cannot gain any advantage by diluting the ink for the lighter tints of the drawing, as the printing ink will take effect equally upon all the lines, and at once render all of them equally black. The object of the artist is to mix the ink to that consistency which, whilst it works freely, shall yet be strong enough to stand perfect through the process of printing. A consistency a little stronger than writing ink is sufficient for this purpose.

The chalk cannot be used upon the polished stone.

The *grained* stone, prepared for chalk, being carefully wiped to free it from dust, must be drawn upon with the crayon as common drawing chalk is used on paper. The subject may be traced on the stone with lead pencil or red chalk, but care should be taken to do this very lightly, so as not to fill up any of the grain of the stone. In drawing, the degree of pressure of the hand will vary the strength of the tint, and it is desirable to give the requisite strength at once, as the surface of the stone is a little altered by receiving the chalk, and hence it does not take any additional lines with the same equality. Practice is necessary to give a command of the material, as it does not work quite like the common crayon, there being great difficulty in keeping a good point. There is also much difficulty in obtaining the finer tints found in the impression; and for the light tints it is necessary to put the chalk in a reed, as the metal port-crayon is too heavy to draw them, even without any pressure from the hand; and therefore the artist cannot draw them with freedom, as his touch will be unsteady, by being obliged to support the pencil from the stone.

It is necessary to observe the grain with which the stone is prepared, which should vary with the fineness of the drawing. Several pieces of chalk should be prepared to use in succession, as the warmth of the hand softens it.

It is useful to cut the chalk in the form of a wedge rather than a point, as it is less likely to bend in that form.

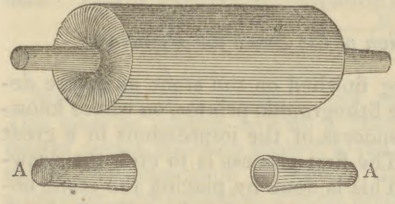
Small portions of the point will break off during the drawing; and these must be carefully removed with a small brush.

4. *Printing Press and Roller.*

The printing press for lithography does not differ materially from the ordinary copperplate press. A detailed description of one of the most approved construction will be given under the article Printing. Printing press.

The Roller.

The following is a representation of the roller:



The length may vary, Roller. but it ought to be full four inches in diameter. It is covered with flannel, rolled tightly three or four times round, and nailed at the ends. It is then covered with a stretched calf-skin, fitting quite tight. The seam must be made neatly with the boot-maker's closing stitch. The ends of the leather are gathered with a string, and tied round the projecting ends of the roller. Loose handles, A, A, made of thick leather, are put on these ends when it is used. The leather must be put on the roller with the smooth side outwards.

5. *Printing Ink.*

The printing ink is composed, as other printing inks are, Printing ink. of oil, varnish, and very fine lamp-black, well mixed together. To prepare the varnish, a saucepan is about half filled with pure linseed oil, and heated over a fire till it ignites from the flame of a piece of burning paper. It should then be allowed to burn till it be reduced to the degree required; and if, during the operation, there appear danger of its boiling over, it should be immediately taken off the fire, and the cover, which ought to fit quite close on the saucepan, must be put on to extinguish the flame. This is to prevent accidents; and the operator cannot be sufficiently cautioned against the danger attending the burning of the varnish, which ought never to be performed in a room with a boarded floor, or indeed in any part of a house. Wet sacks are the best things to put out the flame in case of accident.

Several inks must be prepared, differing in the degree of viscidity, or thickness of the varnish from which they are made, and the quantity of black mixed with them. The longer the oil is burned, the thicker the varnish becomes. The thinnest varnish is burned till it has lost nearly one fourth of its volume; the next till it is reduced one third; the thickest till it is reduced one half.

These directions are to be considered as very general ones; and the state of the varnish is best judged of during the burning, by taking out some with a spoon, and letting a drop fall on a cold earthenware plate, and trying its degree of viscidity with the finger. The thinnest sort should be like common honey, and the other should draw out in strings, which will be longer as the varnish is thicker. The thickest will draw out in strings two or three feet in length.

It is quite essential to have the oil pure, and the saucepan perfectly clean, and to keep the varnish in clean close jars in a cool place. It is best not to make the varnish long before it is wanted; for if any decomposition takes place in it, the drawing will be spoiled by the printing ink. The black is mixed with the varnish on a grinding stone with a muller, in small successive quantities; care being taken that the first portion of black is equally mixed with the varnish before a second is added. In the thickest inks this requires considerable labour. By mixing the varnishes together, any degree of stiffness of the ink may be obtained; and by putting more or less black, its thickness is regulated. The printer must always have by him several small pots, each containing a different printing ink, to be used as occasion requires. A small quantity, not more than the size of a hazel-nut, should be used at a time; for it is desirable to charge the roller with as small a quantity as possible. It must be worked well on the colour table with the roller in all directions, that it may be equally distributed all over the roller. Ink drawings are generally printed with a stiffer ink than chalk drawings.

6. *Preparation of the Stone for Printing.*

Etching.

The drawing being finished on the stone as before described, is sent to the lithographic printer, on whose knowledge of his art the success of the impressions in a great measure depends. The first process is to etch the drawing, as it is called. This is done by placing the stone obliquely on one edge over a trough, and pouring over it nitric acid very much diluted. It is poured on the upper part of the stone, and runs down all over the surface. The stone is then turned, and placed on the opposite edge, and the etching water, being collected from the trough, is again poured over it in the same manner. The degree of strength, which is little more than one per cent. of acid, should be such as to produce a very slight effervescence; after the etching water has lain on the stone for a second or two, its strength must vary according to the heat of the atmosphere and the degree of fineness of the drawing. It is desirable to pass the etching water two or three times over the darkest parts of the drawing, as they require more etching than the lighter tints; and when the drawing is fine, a little green should be mixed with it. Some stones also, and different chalks, require different degrees of strength of the acid; and experience alone can guide the lithographer in his practice on this point. Chalk drawings require weaker acid than the ink.

The stone is now carefully washed, by pouring clean rain-water over it, and afterwards with gum-water; and when not too wet, the roller, charged with printing ink, is rolled over it in both directions, viz. sideways, and from top to bottom, till the drawing takes the ink. It is then well covered over with a solution of gum-arabic in water, of about the consistency of oil. This is allowed to dry, and preserves the drawing from any alteration, as the lines cannot spread, in consequence of the pores of the stone being filled with the gum. After the etching, it is desirable to leave the stone for a day, and best not to leave it more than a week, before it is printed from. In some establishments a few proofs are taken immediately after the drawing is etched, but it is better not to do so.

The operation of the etching requires great nicety, and must be done quickly. If the drawing is etched too strongly, the fine tints disappear; if too weak, the printing ink mixes with the darker parts, and the drawing runs into blots. A soft stone requires weaker acid than a hard one, if they are equally pure in quality. The differences in the composition of the stones also require differences in the strength of the etching water, so that no strict or certain rules can be given.

The effect of the etching is, *first*, to take away the alkali mixed with the drawing chalk or ink, which would make the drawing liable to be affected by the water; and, *secondly*, to make the stone refuse more decidedly to take any grease. The gum assists in this latter purpose, and is quite essential to the perfect preparation of the surface of the stone.

7. *Printing.*

Printing.

When the stone is to be printed from, it is placed on the bed or platten of the press; at this time a proper sized scraper for the printing is very carefully adjusted to the surface of the stone. The gum on the stone is now sprinkled with rain-water, and being gradually dissolved, and a wet sponge passed lightly all over it, the printer works the ink which is on the colour table placed beside him, with the roller, in all directions, till it is equally and thinly spread all over the roller. He then, the stone being wet, passes the roller all over the stone in both directions, observing, as his experience enables him to do, that all parts of the drawing take the ink in due proportion. The roller should be applied with an equal motion and pressure, which must be regulated according to the mode in which the drawing takes the ink; if it does not take it readily, the pressure must be increased, and the roller moved more slowly. The roller should turn freely as it passes over the stone; if it slips, the cause is either that the stone is too wet, or that too much of the gum remains upon the stone; in the first case, a drier sponge will correct the evil; in the second, the stone must be again washed with a little water; but this must be done with caution, as the gum should not be entirely washed off the stone.

At first the drawing receives the ink with some difficulty, and it is frequently necessary to wet the stone and roll it in several times, before it will take the ink readily. Care must now be taken not to wet the stone too much; the less dampness the better, provided it is sufficient to keep the stone from taking the ink in the parts where there is no drawing; at all events, no drops of water should be seen upon the stone, as they spoil the printing ink, and also are imbibed by the roller, which therefore becomes unfit for use. After the drawing is thus rolled in, the sheet of paper is placed on the stone, and the impression taken in the manner described in the account of the press. When, after the impression, the paper is taken up, the stone appears dry, the moisture having been imbibed by the paper. It must be again wetted with a damp sponge, and rolled in with ink as before, taking care to work the roller well on the colour table each time before applying it to the stone.

Generally the first few impressions are imperfect, from the drawing not taking the ink fully; but this is gradually corrected in the succeeding impressions.

During the printing some gum must always remain on the stone, though it will not be visible, otherwise the ink will take on the stone, and also spoil the drawing. If, by too much wetting, or by rubbing too hard with the sponge, the gum is entirely removed, some fresh gum-water must be laid on. If the stone has, in the first instance, been laid by with too small a quantity of gum, and the ink stains the stone on being first applied to it, gum-water must then be used to damp the stone instead of pure water. Sometimes, however, this may arise from the printing ink being too thin, as will appear below. If some spots on the stone take the printing ink, notwithstanding the above precautions, some strong acid must be applied to them with a brush; and after this is washed off, a little gum-water is dropped on the place. A steel point is here frequently necessary to take off the spots of ink. The edges of the stone are very apt to soil, and generally require to be wiped with an old sponge or rag after the rolling in. They must also frequently have an application of acid and gum, and sometimes be rubbed with pumice-stone. Chalk drawings are much the most difficult to print. After this general description of the printing, the following development of the principles on which it is regulated, and notice of the difficulties which arise in its progress, will be found useful. *An ink which is too thin*, and formed of a varnish not sufficiently burned, will soil the stone, notwithstanding that the proper precautions are taken of wetting the stone, and preparing it properly with acid and gum. *Ink which is too stiff* will tear up the lighter tints of the chalk from the stone, and thus destroy the drawing.

The consideration of these circumstances leads us at once to the principles of the printing. These accidents arise at the extreme points of the scale at which the printing inks can be used; for it is evident, that the only inks which can be employed are those which are between these points, that is, thicker than that which soils the stone, and at the same time thinner than that which takes up the drawing. Any increase of temperature will diminish the consistency of the printing ink; the stone will therefore soil with an ink which could be safely used at a lower temperature; hence a stiffer ink must be used. Now, if the temperature should increase so much that the stone will soil with any ink at all less thick than that which will take up the drawing, it is evident that the printing must cease till, by standing, the lines of the drawing shall have acquired additional strength. This, though it sometimes occurs, is a rare case; but it shows that it is desirable to draw with a chalk or ink of less fatness in summer than in winter; and also, that if the printing-room is in winter artificially heated, pains should be taken to regulate the heat as equally as possible.

We will now enumerate some other difficulties which are not referrible to the above general principle.

If the pressure of the scraper is too weak, the ink will not be given off to the paper in the impression, although the drawing has been properly charged with it. Defects will also appear from the scraper being notched, or not correctly adjusted, or from any unevenness in the leather or paper.

Inequalities in the roller will cause the drawing to receive the ink unequally, and if the roller or its leather is too hard, it will not ink the drawing clearly.

After printing a considerable number of impressions, it sometimes happens that the drawing takes the ink in dark spots in different parts. This arises from the printing ink becoming too strongly united with the chalk or ink of the drawing, and if the printing is continued the drawing will be spoiled. A little consideration will show us the reason of this accident. The printing ink readily unites with the drawing, and being of a thinner consistency, it will by repeated applications accumulate on the lines of the drawing, soften them, and make them spread. In this case it is necessary to stop the printing, and let the stone rest for a day or two, for the drawing to recover its proper degree of hardness. If the drawing should run smutty from any of the causes before enumerated, the following mixture will clean it.

Mi ture to ean th drawin while pr ting.

Take equal parts of water, spirits of turpentine, and oil of olives, and shake them well together in a glass phial, until the mixture froths; wet the stone, and throw this froth upon it, and rub it gently with a sponge. The printing ink will be dissolved, and the whole drawing also will disappear, though, on a close examination, it can be distinguished in faint white lines. On rolling in again with printing ink, the drawing will gradually re-appear as clear as at first.

B ched pa r unfit fo ithogr hy.

Accidents sometimes occur in the printing, from the qualities of the paper. If the paper has been made from rags which have been bleached with oxymuriatic acid, the drawing will be incurably spoiled after thirty impressions. Chinese paper has sometimes a strong taste of alum; this is so fatal as to sometimes to spoil the drawing after the first impression.

Printing ink.

When the stone is to be laid by after printing, in order that it may be used again at a future period, the drawing must be rolled in with a *preserving ink*, called by Senefelder, *aetzfarbe*, as the printing inks would, when dry, become so hard, that the drawing would not take fresh printing ink freely. The following is the composition of the preserving ink.

Thick varnish of linseed oil	2 parts.
Tallow	4 do.
Venetian turpentine	1 do.
Wax	1 do.

These must be melted together, and then four parts of lamp-black very carefully and gradually mixed with it, and it must be preserved for use in a close tin box.

Very fine effects are produced in lithographic prints, by printing from two or more stones with different coloured inks. This is managed by preparing a composition of

Wax	2 parts.
Soap	1 do.
A little vermilion.	

Melt them in a saucepan, and cast them into sticks. This must be rubbed up with a little water to the thickness of cream, and then applied to the surface of a polished stone. An impression is taken in the common way from a drawing, and applied to a stone prepared in this manner, and passed through the press, care being taken to mark, by means of this impression, two points in the margin corresponding on each of the stones. The artist having thus on the second stone an impression from the first drawing to guide him, scrapes away the parts which he wishes to remain white in the finished impression. The stone must now be etched with acid stronger than the common etching water, having one part of acid to twenty of water. The whole is then washed off with turpentine.

This plan has been very much followed at Munich, and in this country some splendid specimens have lately been produced. It is generally used to print a middle tint from the second stone. The black impression being given from the first stone, a flat transparent brownish tint is given from the second, and the white lights are where the paper is left untouched. The dots are necessary to regulate the placing of the paper on the corresponding parts of the two stones.

The coloured inks for the tints are differently made, according to the tint required, but the varnishes alone make very good light browns.

The paper for lithographic printing should not be so damp as for copperplate printing.

8. *Different manners of Lithography.*

Besides the manners already described of drawing with ink and chalk, lithography is practised in various other ways.

Transfers.

Transfers.

The most useful of these is the transfer before alluded to in speaking of the inks, as it saves the labour and inconvenience of writing backwards. This is performed by writing with the composition ink on a prepared paper, and then transferring the writing to a stone, by passing it through the press.

Tints.

Dissolve in some water half an ounce of gum-tragacanth, to which, after it is well mixed and strained, add one ounce of glue and half an ounce of gamboge.

Then take of French chalk	4 ounces.
old plaster of Paris	½ ditto.
starch	1 ditto.

Powder these, and sift them through a fine sieve; grind them with a portion of the gum-tragacanth, glue, and gamboge; then add sufficient water to give it the consistency of oil, and apply it with a brush to thin sized paper. The writing must be made with the ink on the prepared side.

When the transfer is to be made, a polished stone is warmed to about 130° Fahrenheit, and placed in the press. The paper is then carefully damped at the back with a sponge, and placed between some sheets of soft paper. It is next placed on the stone with the writing towards it, and passed through the press as in printing an impression. This must be repeated four or five times without raising the leather cover of the bed of the press, beginning with a slight pressure at first, and increasing it every time. The press is now to be opened, and the paper, being damped, taken off, when the writing will appear to have come off the paper on the stone.

When the stone is quite cold, it is etched and prepared for printing in the usual manner.

This mode is peculiarly valuable for maps, plans, writings, &c. when expedition and economy are objects of importance; and the impressions produced by skilful lithographers retain all the purity and sharpness of the original drawing or writing.

Imitation of Wood Cuts.

Imitation of wood cuts.

This is a very easy mode, though not much practised. A polished stone is covered all over with lithographic ink, and the parts which are to be left white are scraped away with a steel point. Very fine lines are most easily obtained by putting them in with a hair pencil. The stone is etched as before described.

Etchings on Stone.

Lithographic etchings.

A polished stone is prepared for this mode by washing it with diluted acid as weak as the water used for etching a drawing; and after that is washed off, and the stone is dry, it is to be covered with weak gum-water and a little lamp-black. This forms a coating to the stone, and the artist works on it with an etching needle, as in etching upon copper. The lines which he traces appear white, but look stronger than they will appear afterwards. The stone should be a little warmed, for the needle to work freely through the coating, and care must be taken not to breathe upon it. When the etching is finished, the surface is to be rubbed all over with linseed oil, which penetrates into the lines drawn by the needle. After this the coating is to be all washed off with water.

In this mode lines can be drawn as fine as on copperplate; it is, however, but little practised in England, though it is often employed in Germany.

The great distinction between lithography and engraving, when employed for works of art, is, that the former gives a fac-simile of an original drawing, which retains all the freedom and touch of the artist's own hand; whilst, on the contrary, an engraving must be a copy. This character in a lithographic print arises from the facility with which the drawing is produced, as the process is exactly that which the artist would follow in making a common drawing: and the farther advantage of a great saving of expense is derived from the same cause; for the drawing being made at once on the stone, the whole expense of the engraving is saved. This is particularly the case with drawings in chalk, or with outlines or slight works in ink; and thus the door is opened to the production of many works which could not otherwise be published on account of the expense of engraving.

The more finished drawings in ink, however, have not the same advantages, for the gradations in tint can be obtained only by the variations in the breadth and distance of the lines, which is the same principle as that on which the engraver works; and hence the labour is more nearly equal in the two methods.

There is, however, much less difficulty in drawing lines on the stone than in cutting them on copper, and of course the operation is less expensive; and the cost of printing from stone is also considerably under that of printing from plates, which renders the employment of lithography doubly advantageous when a large number of copies are required. The number of impressions that may be taken from a chalk drawing varies according to the fineness of the tints and the manner in which the drawing has been executed. Some drawings will be exhausted by 1500 or 2000 copies, others have stood 20,000, and some even 30,000 impressions.

Ink drawings and writings give considerably more; the finest, if properly managed, will give from 6000 to 10,000; others it seems to be impossible to exhaust, hundreds of thousands having been printed from some without any material injury.

The advances which lithography has made within these few years have been really immense. Specimens in the chalk manner have been produced which vie in beauty with the stippled engravings in the line manner. Efforts equally wonderful have been made, and there seems no reason to doubt that further improvements will yet be effected in this infant art. The external delicacy of tint of the finest engravings there is reason to believe, as has already been shown, it never can equal; and it is more than probable that the station which it has already attained, is that which it is destined to fill; that is, betwixt the first class of engravings and the middling productions of copper and steel, its greatest advantages being economy and expedition in the execution. The innumerable instances in which the public have already been presented with valuable works by means of lithography, which could not have been produced by the more expensive and tedious mode of engraving, are sufficient evidences of its vast importance, and afford ground for the anticipation of still greater benefits.

LITHOMANTIA, in *Antiquity*, a species of divination performed with stones. Sometimes the stone called *siderites* was used. This they washed in spring-water in the night by candle light; and the person who consulted it was purified from all manner of pollution, and had his face covered. This being done, he repeated divine prayers, and having placed certain characters in an appointed order, the stone then moved of itself, and in a soft, gentle murmur, or, as some say, in a voice like that of a child, returned an answer. By a stone of this nature Helenus is reported to have foretold the destruction of Troy.

LITHONTRIPTICS (from *λιθος, a stone*, and *ϑρυπτω, to break*), an epithet applied to medicines that are supposed to break or dissolve the calculus in the bladder.

LITHOSTROTON, amongst the Romans, was a pavement of mosaic work, consisting of small pieces of cut marble of different kinds and colours, and first used in the time of Sylla, who caused one to be formed at Præneste, in the temple of Fortune, and afterwards in private houses. They were brought to such perfection, that they exhibited representations of nature with all the accuracy of the finest painting.

LITHOTOMY, in *Surgery*, the operation of cutting for the stone. See SURGERY.

LITHUANIA, an extensive province of Poland, now annexed to Russia. See the article RUSSIA.

LITINA, a circle of the Russian province of Podolia, extending in north latitude from 49. 5. to 49. 45., and in east longitude from 27. 45. to 28. 31. It is watered by the Bug, and has a rich and productive soil. The chief place, of the same name, is 1028 miles from St Petersburg. Long. 27. 4. E. Lat. 49. 19. N.

LITMUS, in the arts, is a blue pigment, formed from *archil*. It may be prepared by adding quicklime and putrified urine, or spirit of urine distilled from lime, to archil previously bruised by grinding. The mixture being cooled, and the fluid suffered to evaporate, becomes a mass of the consistence of a paste, and is laid on boards to dry in square lumps. It is only used in miniature paintings, but cannot be much depended on, because the least approach of acid changes it instantly from blue to red.

LITTER (*lectica*), a kind of vehicle borne upon shafts, anciently esteemed the most easy and genteel way of carriage. Du Cange derives the word from the barbarous Latin *lecteria*, straw or bedding for beasts; but others conceive that it comes from *lectus*, a bed. Pliny calls the litter the *traveller's chamber;* it was much in use amongst the Romans, and was borne by slaves kept for that purpose. The Roman *lectica* made to be borne by four men was called *tetraphorum;* that borne by six, *hexaphorum;* and that borne by eight, *octaphorum.* The invention of litters, according to Cicero, was due to the kings of Bithynia.

Litter also denotes a parcel of dry old straw put on the floor of a horse's stall, for him to lie down and rest upon.

LITTLETON, Sir Thomas, a judge of the common pleas, was the eldest son of Mr Thomas Westcote, of the county of Devon, by Elizabeth, sole heiress of Thomas Littleton of Frankley in Worcestershire, at whose request he took the name and arms of that family. He was educated at one of the universities, probably at Cambridge, and thence removed to the Inner Temple, where he became one of the readers. He was afterwards made steward or judge of the court of the palace, or marshalsea of the king's household, to Henry VI. In 1455, being the thirty-third of that reign, he was appointed king's sergeant, and travelled the northern circuit as judge of assize. In 1462, the second of Edward IV., he obtained a pardon from the crown; and, in 1466, was appointed one of the judges of the common pleas, and went the Northamptonshire circuit. In the year 1474 he was, with many of the first nobility, created knight of the bath. He died in 1481, and was buried in the cathedral church of Worcester, where a marble tomb, with a statue on it, was erected to his memory. As to his character as a lawyer, it is sufficient to state, that he was the author of the treatise upon tenures, on which Sir Edward Coke wrote a comment, well known by the title of *Coke upon Littleton.*

Littleton, *Adam*, descended from an ancient family in Shropshire, was born in 1627, educated at Westminster school, and entered at Oxford as a student of Christ Church, whence he was ejected by the parliamentary visitors in 1648. Soon afterwards he became usher of Westminster school, and in the year 1658 was made second master of that institution. After the Restoration he taught a school at Chelsea in Middlesex, and was admitted rector of the church of that place in the year 1664. In 1670 he obtained his degree in divinity, being then chaplain in ordinary to his majesty. In 1674 he became prebendary of Westminster, of which church he was afterwards sub-dean. Besides the well-known Latin and English Dictionary, he published several other works. He died in the year 1694, and was interred at Chelsea.

LITURGY denotes all the ceremonies in general belonging to divine service. The word comes from the Greek, λειτουϱγια, *service, public ministry*, formed from λειτος, *public*, and ἐϱγον, *work*. In a more restricted signification, liturgy is used amongst the Roman Catholics to signify the mass, and amongst the Episcopalians it is used to signify the common prayer.

In the primitive days divine service was exceedingly simple, being clogged with but few ceremonies, and consisting of only a small number of prayers; but by degrees the number of external ceremonies was increased, and new prayers were added, to make the office look more venerable to the people. At length things were carried to such a pitch, that regulation became necessary; it was found proper to put the service, and the manner of performing it, into writing; and this was what was called a *liturgy.*

In the early ages of the church every bishop had the power to form a liturgy for his own diocese; and if he kept to the analogy of faith and doctrine, all circumstances were left to his own discretion. Afterwards the practice was for the whole province to follow the metropolitan church, which also became the general rule of the church; and this Lindwood acknowledges to be the common law of the church, intimating, that the use of several services in the same province, which was the case in England, had no warrant except by long custom.

The liturgy of the church of England was composed in the year 1547, and established in the second year of Edward VI. (2 and 3 Edw. VI. cap. 1.) In the fifth year of this king it was reviewed, because some things were contained in that liturgy which showed a compliance with the superstition of the time, and various exceptions were taken against it by some learned men at home, and by Calvin abroad. Certain alterations were made in it, which consisted in adding the general confession and absolution, and the communion to begin with the ten commandments. The use of oil in confirmation and extreme unction was left out; prayers for souls departed, and what tended to a belief of Christ's real presence in the eucharist, were also omitted. This liturgy, so reformed, was established by the act 5 and 6 Edward VI. cap. 1. But it was abolished by Queen Mary, who enacted that the service should stand as it was most commonly used in the last year of the reign of Henry VIII. The liturgy of 5 and 6 Edward VI., however, was re-established with some few alterations and additions by 1 Elizabeth, cap. 2. Some further alterations were introduced, in consequence of the review of the common-prayer book, by order of James I. in the first year of his reign, particularly in the office of private baptism, in several rubrics, and other passages, with the addition of five or six new prayers and thanksgivings, and all that part of the catechism which contains the doctrine of the sacraments. The book of common prayer, so altered, remained in force from the first year of James I. till the fourteenth of Charles II. The last review of the liturgy was made in the year 1661, and the last act of uniformity enjoining the observance of it is 13 and 14 Car. II. cap. 4.

LITUUS, amongst the Romans, was the staff made use of by the augurs in quartering the heavens. It was crooked at one end, and thickest in the curved part, according to Aulus Gellius. Upon medals we frequently meet with a representation of it, amongst other pontifical instruments. It was called *Lituus Quirinalis,* from Quirinus, a name of Romulus.

Lituus was also an instrument of music in use in the Roman army. It was straight, excepting that it had a little bending at the upper end, like a lituus or sacred staff of the augurs; and from the similitude it derived its name.

LIVADIA, an ancient town of Turkey in Europe, and capital of a province of the same name in Greece. It is a large and populous place, situated on the Gulf of Lepanto, about twenty-five miles from the city of that name. It has now a considerable trade in woollen stuffs and rice. Anciently it was celebrated for the oracle of Trophonius, which inhabited a cavern in a hill above the town. Long. 23. 29. E. Lat. 38. 40. N.

LIVER. See Anatomy

LIVERPOOL.

Liverpool.

This town, which, after London, is the most considerable place of commerce in the British empire, or perhaps in the world, is situated in the hundred of West Derby, on the eastern bank of the river Mersey, in 53° 22′ 30″ of north latitude, and 2° 57′ of longitude west from Greenwich, at a distance of 30 miles west of Manchester, and 205 miles north-west of London. The town is bounded on the west by the river Mersey, on the east by Low Hill and Everton, on the north by the township of Kirkdale, and on the south by Toxteth Park.

The limits of the ancient borough were defined by marks called mere-stones, within which its liberties were included. It occupied an area of 2202 acres, of which about 1000 belonged to the Corporation, and the rest to individuals; but under the Parliamentary and Municipal Reform Acts, the limits of the present borough have been greatly extended, and now include a large part of Toxteth Park, Edge Hill, Low Hill, West Derby, Everton, and Kirkdale.

History.

The name of this place has given rise to much discussion. The most ancient record in which it is mentioned, is the charter of Henry II., where it is called Lyrpul or Litherpul, either of which is inconsistent with the fanciful derivation from the heraldic bird called the liver. It seems to be agreed that the latter part of the name designates a *pullum*, or pool of water; and Camden, who gives a Saxon derivation, explains only the termination.[1] But as the name *Lyferpole* does not rest upon any Saxon authority, its correctness may be questioned. To account for the more ancient orthography, however, it has been supposed that the name *Litherpool* was formed of the words *lithe pol*, signifying gentle lake. In an assessment of Lancashire, made in 1245, when Lancaster was charged thirteen merks, and Preston fifteen, Liverpool paid only eleven. In Leland's account of his journey, made about the years 1515 and 1516, we find this passage: "Lyrpole, or Lyrpoole, is a pavid towne, hath but a chapel, Walton a iv miles of, not far from the se is paroche chirch. The king hath a castlet there, and the Erle of Darbe hath a stone house there. Irisch marchants cum much thither as to a good haven. At Lyrpole is smaule custom payid, that causith marchants to resort. Good marchundise at Lyrpole, and much Irisch yarn that Manchester men do by ther."

A charter was granted to this town by King John in 1203, and renewed by Henry III. in 1228, by which he constituted Leverpolle a free borough. In 1272 a census was taken of the town, when it was found to consist of 168 houses, and occupied by about 800 inhabitants. Some records of the year 1555 represent it as a poor and obscure place, having only 138 householders and cottagers; but six years afterwards, the number of vessels belonging to the port were twelve, of 177 tons, and manned by 175 seamen.

In 1626 Charles I. granted a new charter, by which a corporate and politic body was created. At the levy of ship-money, in the early part of that reign, this town was assessed for L.25, whilst Chester was rated at L.26, and Bristol at L.1000, which may be some guide to the relative importance of the several places. During the civil war, in the latter part of this reign, it was the scene of several conflicts between the royalists and the parliamentarians; and, after a siege, when it was taken by the former, it suffered severely by the plague, which carried off 200 of its inhabitants. About this time, the ships in Liverpool and the dependent ports had increased as follows:—

Liverpool. . ships, 24 . . tons, 462 . . men, 76.

After the restoration, and the internal national peace that followed it, Liverpool seems gradually to have gone on increasing in extent, population, and trade. It appears that, in 1753, there were 3700 houses, and 20,000 inhabitants; and that in 1760, the houses were 4200, and the population 25,000. Dr Enfield, to whom we are indebted for these two comparative statements, does not give any data that can be implicitly confided in, but they have every appearance of approximating to accuracy.

Till the year 1698, Liverpool was included in Walton parish, but in that year it was separated from it. In 1699 it became an independent parish. The first newspaper was established in the year 1756; and in the year 1760, the first stage-coach was established between Liverpool and London. In 1770, the public library commenced, and about the same time the Society of Artists of Liverpool was founded.

The African and West India trade had been rapidly growing during seventy years, and all other branches had also been increasing. In the year 1754, there were

83 ships in the African trade.
124 ... in the West India trade.
28 ... in the American and foreign trade.
21 ... in the London cheese trade.
101 coasters and Irish traders.
80 sloops and flats on the river.

At this time a new dock was constructed, and received the name of the Salt-house Dock.[2] From that period, the progress of Liverpool has been truly without example in any other British port, or perhaps in any other age or country.

Antiquities.

On the site of St George's Church, formerly stood the ancient castle of Liverpool. According to Camden, it was built as early as the year 1076. Whatever may have been its origin, it was demolished by order of Parliament in the year 1659; but it existed in a dilapidated state from that time till the year 1721, when it was razed to the ground. There was also a building denominated the Tower, which occupied a site of about 3700 square yards, and was situated near the bottom of Water Street. It served for ages as the residence of the Earls of Derby, then as an assembly-room, and afterwards as a prison. It was demolished in 1819, and with it disappeared the last remaining vestige of the ancient days of Liverpool.

Population.

The state to which Liverpool has arrived, and the gradual steps by which it has been accomplished, within the present century, may be most accurately shewn by the returns obtained in the four decennial enumerations of Great Britain, which, by the diligence and acuteness of Mr Rickman, have been collected, arranged, and presented to the two houses of parliament. Every ten years exhibits more fully the state of the country than was to be found in the volumes that preceded it.

Population of Liverpool, including that of Toxteth Park.

1801.	1811.	1821.	1831.
79,722	100,240	131,801	189,242

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[1] Ubi *Litherpoole* floret, Saxonice *Lyferpole*, vulgo Lirpool, a diffusa paludis in modum aqua, ut opinio est, nominatus. Camden *Britan.* p. 614. 1590, 8vo.

[2] The first dock constructed was the Old Dock, as it is called, which had been formed in 1699.

In the last of these years, the families were 38,122, of whom 227 were chiefly employed in agriculture; 18,881 were principally employed in trade, manufactures, or handicraft; and 19,014 were not comprehended in either of the before-mentioned classes.

The number of males who had attained the age of twenty years was 44,726. Of these, the portion employed in agriculture were, 39 occupiers of land, employing labourers; 165 occupiers of land, not employing labourers; and 132 employed as labourers in agriculture. The remainder are thus classed: 359 making manufacturing machinery; 21,208 employed in retail trade, or in handicraft, as masters or as workmen; 5201 capitalists, bankers, professional and other educated men; 16,095 labourers employed in labour not agricultural; 1214 others not particularly classed, and 313 domestic servants. The number of female servants was 9033.

Of the whole population, as before stated, of 189,242 individuals, the males were 87,919, and the females 101,323. The excess of the latter over the former may be attributed to the number of seafaring people, a part of whom must necessarily be much absent from their residences.

The rapid increase of the town will be observed from what has been stated; but the most authentic record of this increase is to be found in the bills of mortality, as preserved in the parish registers, and from them the following results are derived:—

	1700.	1760.	1800.	1810.	1820.	1830.	1834.
Baptisms,...	132	986	3033	4001	4718	7258	8154
Burials,......	124	599	3157	1544	3680	3845	5881
Marriages,..	35	408	1217	1434	1653	2220	2675

Exclusive of the baptisms, marriages, and burials in the places of public worship in Toxteth Park and Everton, and of the burials at the Necropolis, which, in 1834, amounted to 1586.

It appears by the bills of mortality that the increase of the population, as shewn by deducting the number of burials from the number of baptisms, would have been only 22,108 individuals in the ten years, from the year 1821 to the year 1831; whereas the returns shew an increase of 59,441; thus proving that besides the increase from itself, there must have been an immigration of 37,333 persons at Liverpool. The increased salubrity of the town is also observable. The whole of the burials in 1821 were 3267, out of a population of 131,801, or about one in forty; and in 1830 they were 3620, out of a population of 189,242, or one in fifty-two.

The increase in the population since 1830 has been remarkably steady, although the town has been twice visited by the cholera, and on one of the occasions very severely. The births in 1835 were 8145.

Docks. One of the main causes of the increase and prosperity of Liverpool has been the construction of the docks for the reception of ships. The river Mersey, on the right bank of which the town is built, empties itself through a great estuary filled with banks, and crossed by a bar at its mouth, which is very shallow at low-water; but the tides rise twenty-one feet at neap, and twenty-eight feet at spring-tides. The land around is low, and ships in the river are in consequence exposed to gales of wind. The entrance to the river is easy and safe, from some of the prominent objects on the peninsula which separates the Dee from the Mersey; and the nearer approach to the harbour has been facilitated by the construction of light-houses, by the erection of buildings called the Bootle-marks on the shore, by the establishment of floating-lights, and by an appropriate placing of buoys to mark the channel. The Mersey is navigable for vessels of sixty tons thirty-five miles above Liverpool, to the confluence of the Irwell. The river Weaver falls also into the estuary, and is navigable for vessels of sixty tons as far as Northwich, the great depository of rock-salt. It was to remedy the inconveniences felt after entering the harbour, that the docks here described were constructed. Between the town and the river, a tract of low land, nearly three miles in length, extending to low-water mark, was found adapted for the purpose of forming docks. The space thus recovered from the sea by persevering labour has been gradually converted into docks, containing 111 acres, and much of it is covered with warehouses and other buildings required by commerce.

Brunswick Dock. In the notices of the docks, we shall follow their position from south to north rather than the date of their construction. The southernmost of these is the Brunswick Dock. It is the largest of all, being chiefly constructed for the use of vessels employed in the timber trade. The east and west ends are 430 yards long, and the north and south 140 yards. It is connected with another, called the Half-Tide Basin, the dimensions of which are 120 by 108 yards.

Queen's Dock. The Queen's Dock, which is next to the Brunswick, has a communication with it by means of the Half-Tide Dock of the latter. It was opened in 1796, and is now chiefly frequented by vessels from the Baltic and from Holland. The mean length is about 400 yards, and the mean breadth about 100 yards. The gates are 42 feet wide, and 28 deep. At the south end, and the east and west sides, there are well-constructed sheds, affording shelter from the inclemency of the weather, whilst the cargoes are receiving or discharging. The quay is very extensive, and between it and the river are two graving-docks, 170 yards in length, admirably calculated for the building and repairing of ships.

King's Dock. The King's Dock, to the north of the Queen's and with an opening into it from a basin common to both, was first used in the year 1788. It extends from north to south 270 yards, and from east to west 95 yards. It is surrounded by spacious quays, with sheds for discharging tobacco, which constitutes the cargoes of most of the vessels that repair to it. The entrance, which is on the south side, has strong gates, 28 feet deep, and 42 wide, with a cast-iron bridge turning on a swivel. On the west side of this dock is one of the most capacious storehouses in the world, intended as the warehouse for bonded tobacco. It is a plain brick building, with walls eighteen inches in thickness, extending from north to south 575, and from east to west 239 feet; being in extent fifty per cent. more than the internal area of St Paul's cathedral in London, and containing three acres one rood and twenty perches. In this dock a vessel has been converted into a floating chapel, in which divine service is performed on Sundays. The pier on the west side forms a fine promenade, from which an extensive prospect over the river may be obtained.

Bridgewater Dock. The next dock, so called from the name of the constructor, the late Duke of Bridgewater, is small, but elegantly constructed. It has a range of storehouses upon an arch, under which vessels may enter and have their loading drawn up to the proper warehouses above them. This is private property, now belonging to Lord Francis Egerton, and used for purposes connected with his vast excavations and water communications on the Bridgewater canal.

Salthouse Dock. Nearest to the Bridgewater, and to the north of it, is the Salthouse Dock, which was opened in 1753. The form of this dock is irregular, being on the east side 297 yards, on the south end 80 yards, and on the north end 150 yards; the whole, with the passage, comprehending an area of 23,025 square yards. On the east side is a range of extensive warehouses, under the front of which is a piazza for the accommodation of passengers. The vessels which chiefly occupy this dock are those from the Levant, and the coasters from the neighbouring ports, and many from Ireland.

Dry Dock. The Dry Dock, next to the north, is also of an irregular figure. The west side is 150 yards in length, the north end 64 yards, the east side 219 yards, and the south end 108 yards. It has connected with it the graving docks, which are made use of for the purpose of building or repairing ships. The vessels which chiefly repair to this dock are those loaded with foreign corn, or employed in the coasting trade; the former generally load back with different kinds of foreign or colonial articles with which Liverpool is at all times well stored.

George's Dock. George's Dock, originally commenced in the year 1767, was repaired and considerably enlarged about ten years ago. It communicates at the south end with the Dry Dock by means of a canal 110 yards long, the gates of which are 25 feet long, 36 deep, and 42 wide. The dock is 246 yards long, and 100 broad, containing an area of 26,068 square yards. On the eastern side is a magnificent pile of warehouses, with an extensive piazza for the accommodation of foot passengers. The quay room around is spacious, and on the western side sheds are constructed to protect the goods, as they are landed, from the inclemencies of the weather. The basin belonging to this dock is at the north end, and its dimensions are, on the south side 163 yards, on the east and west sides 112 yards, and on the north side 154 yards. Within it is the Mariner's Church, in which divine service is weekly performed to the seamen.

Manchester Dock. To the south of the pier-head of this dock is a smaller one, the property of the Mersey and Irwell Company, called Manchester Dock, which is appropriated solely for the purpose of receiving the flats belonging to the company, which are loaded or discharged with their articles from the adjacent counties.

Prince's Dock. The most beautiful as well as the most stable of all the docks, is that called Prince's, which was begun in May 1816, and opened on the day of the coronation of King George IV., viz. on the 19th of July 1821. The length of the dock from north to south is 500 yards, and the average breadth from east to west is 110 yards, thus containing an area of 54,000 square yards. The total expense, as appears from official vouchers, was L.461,059 : 19 : 4, exclusive of the land, which is valued at L.100,000. At each end there is a dwelling-house, with appropriate offices, designed for the use of the dock-masters. There are two entrances; one from the George's Dock basin at the south, the gates of which are 45 feet wide, and 34 deep; and another at the north end, whose gates are of the same dimensions. Each of these passages is furnished with a lock, so contrived as to admit vessels either in or out at half-tide. The dock and its quays are inclosed with brick walls, having gates at the north and south ends, and on the east side. Between the western wall and the river is the Marine Parade, which is 700 yards long and 11 yards broad, and protected on the side next the water by a stone wall about a yard in height. There are also three flights of steps down to the river, for the convenience of passengers, who may land or embark in any state of the tide. When the tide is in, this forms a most varied and delightful promenade. The basin belonging to the Prince's Dock is situated at the northern end of it, and is 140 yards long, and about 134 wide at the centre, but differs a few feet at each end.

Clarence Docks. The newest, as well as the most northern of the docks, is that named the Clarence, in honour of William IV. It was first opened in September 1830. It consists of a principal dock, 250 yards long, 135 yards broad at the north end, and 111 yards at the south end, with a basin 160 yards by 100, between it and the river, furnished with gates, by means of which vessels may be allowed to pass either inward or outward at half-tide. The stone of which the walls are formed is of the most durable quality, and the masonry surpasses that of most works of the same description. On each side of the passage two beautiful circular offices have been erected, supplied with windows on all sides, through which a complete view may be obtained of every part of the dock and of the quays. A lofty and spacious shed extends the entire length of the eastern side, and the whole of these works is surrounded by a strong and lofty wall.

New Docks. Between the Clarence and the basin of the Prince's Dock, there are constructing three other wet docks, with an extensive graving dock, which is to be furnished with patent slips. One of them, the Waterloo Dock, is open to vessels, and requires only some additions to be made to the pier to complete it; the others are likely to be finished very shortly. They are to be called the Victoria and Trafalgar Docks.

The whole of these works are defended against the force of the powerful tides, which twice in twenty-four hours assail them, by a strong sea-wall more than two miles and a-half in length.

To this general description we are enabled to add, from an official paper, the following table, shewing the area of water contained in the stupendous excavations, and the quantity of quay-space which they afford :—

	Area of water in square yards.	Quay space in lineal yards.
DRY BASINS.		
Prince's Basin, . . .	20,999	509
Seacombe Basin, . . .	1,805	188
George's Basin, . . .	16,372	455
George's Ferry Basin, . .	1,344	160
Old Dock Gut, . . .	7,737	447
Queen's Basin, . . .	24,391	601
Brunswick Basin, . . .	23,622	572
South Ferry Basin, . . .	2,927	205
WET DOCKS.		
Prince's Dock, with its 2 locks, .	57,129	1613
George's Dock, with its 2 passages,	26,793½	1001
Dry Dock as altered, . . .	19,095	500
Salthouse Dock, with its passage,	23,025	759
King's Dock, with its passage, .	37,776	875
Queen's Dock, with its 2 passages,	51,501½	1255
Half-tide Dock, with it passage,	13,185½	497
NEW NORTH WORKS.		
No. 1 Dock, with No. 1 Lock, and half of passage, . . .	30,764½	1012
No. 2 Dock, with Entrance-Lock, and half of 2 passages, . .	29,085½	839
No. 3 Dock, with No. 2 Lock, and half of passage, . . .	33,642½	1050
No. 4 Dock, with its Lock, .	29,313	914
Half-tide Basin, . . .	17,605	586
NEW SOUTH DOCKS.		
Brunswick Dock, with its passage,	60,824	1092
Half-tide Basin, . . .	9,245	483

This forms a total, of dock-room of one hundred and eleven acres, and the quay-space extends to nearly eight miles in length. The whole length of the river wall is about two miles and a half, exclusive of openings.

Proper precautions are adopted for clearing these docks from the mud, which every influx of the tide carries into them, and this purpose is effected by the aid of improved machinery, worked by steam. Strict rules are established and enforced as a guard against fire. No ship is allowed to have any gunpowder on board, nor any combustible articles on the deck. No fire is allowed in any ship, nor a candle to be lighted, except in a lantern, and these only to be used in the presence of a custom-house officer. The arrangements for admitting, or for the exit of vessels, and for their position when in dock, to forward their loading or discharging, are all well known and simple, and are executed under the authority of a dock-master, who is placed at the head of the officers of each dock, with proper persons under him to open and shut the gates at the proper time, and to execute such other business as may be required for facilitating the business to be transacted.

These extensive works have been accomplished by means of loans raised by the dock-trustees on bonds, for the payment of the principal and interest of which the rates are appropriated agreeably to an act of Parliament. When these bonds shall be discharged, or when the income is greater than the expenditure, the duties are to be reduced, so as to leave an amount equivalent to the expenses of the establishment, and to the necessary reparations. Such bonds are safe deposits for the savings of the inhabitants, and for the property of widows, orphans, or any trust-money; and thus great numbers in and around Liverpool are interested in the prosperity of these valuable works.

By means of these establishments, the cost in wear and tear of ships, and the expense of loading and unloading, is less at Liverpool than at most of the other ports of the kingdom. The celerity, also, with which every operation relating to the dispatch of ships is carried on, is greater than elsewhere, and thus an additional saving is effected in the wages and provisions for the masters and crews.

The warehousing or bonding system has tended very essentially to increase the commerce of Liverpool. The number of warehouses and vaults for bonded goods are very considerable, and there are a number of yards for bonded timber, as well as ample granaries under the King's Lock for foreign corn. The estimated value of bonded property is one million and a half Sterling.

Dock d
ies.

Our limits do not allow of tables to shew, for a series of years, the increase of the exports and imports of the various commodities which form the trade of Liverpool. The following table gives the amount of the dock duties received, and will shew the progress of its trade.

A Statement of the amount of Dock Duties received at the port of Liverpool for every 10*th year, ending the* 24*th June, from* 1752 *to* 1835, *both inclusive.*

Year.	Number of Vessels.	Tonnage.	Amount of Dock Duties. L.	s.	d.
1752	...	...	1,776	8	2
1762	1,307	...	2,526	19	6
1772	2,259	...	4,552	5	4
1782	2,496	...	4,249	6	3
1792	4,483	...	13,243	17	8
1802	4,781	510,691	28,192	9	10
1812	4,599	446,788	44,403	7	11
1822	8,136	892,902	102,403	17	4
1832	12,928	1,540,057	170,047	6	11
1833	12,964	1,590,461	182,980	16	4
1834	13,444	1,692,870	191,729	17	8
1835	13,941	1,768,426	198,637	18	9

This account includes not only what is paid for the space and the time which the vessels occupy, but also for the storage of goods in the several warehouses belonging to the docks. In fact, the dock duties and storage duties are about equal, but the latter somewhat exceed the former.

The following official tables will shew more distinctly the manner in which the dock estate is raised, and also the nature of some of the other principal charges to which the commerce of the port is subject.

A Comparative Statement of the Rates and Duties received in the years ending on the 24th of June 1834 *and* 1835.

Year.	Duties on Tonnage.			Duties on Goods.			Lighthouse Duties.			Floating-light Duties			Graving Dock Duties.			Graving Block Duties.			Extra Dock Rent.			Total.		
	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.	L.	s.	d.
1835	87,644	14	5	110,993	4	4	9,791	16	7	4,424	5	10	3,192	19	0	1,528	9	6	249	11	0	217,825	0	8
1834	84,061	15	11	107,688	1	9	9,408	0	8	4,245	0	10	2,911	3	0	1,323	4	6	248	2	10	209,865	9	6
Increase	3,582	18	6	3,325	2	7	383	15	11	179	5	0	281	16	0	205	3	0	1	8	2	7,959	11	2

The amount of the different duties, as stated above, for the present year (1836) is L. 244,814 : 5 : 9.

Dock
evenu

The dock estate is at present under the management of trustees, who give an annual statement of the receipts and payments. The trusteeship, after the 1st November 1836, by the Municipal Reform Act, falls again into the hands of the corporation of the town. From the printed accounts for the two years ending June 24, 1832 and 1833, we give the following abstract:—

	1832.			1833.		
Receipts,	L. 187,873	1	7	L. 201,376	10	11
Payments	303,545	11	7	173,678	1	7

General Statement of the Affairs of the Trustees of Dock up to June 24. 1833.

Dr.

Date		L.	s.	d.
1832. June 23.	To amount of bonds and assignments outstanding this day, ...	L. 1,348,756	0	11
1833. June 24.	To amount of bonds issued since 24th June last, .	57,973	18	0
		L. 1,406,729	18	11

Cr.

Date		L.	s.	d.
1833. June 24.	By amount of bonds and assignments paid off since 24th June last, . .	L. 56,277	12	0
	Amount of bonds and assignments outstanding this day, redeemable up to the year 1845 inclusive, ...	1,350,452	6	11
		L. 1,406,729	18	11

General Statement of the Affairs of the Trustees up to June 24. 1833—*continued.*

Dr.

1833.		L.	s.	d.
June 24.	To amount of bonds and assignments, . . .	L.1,350,452	6	11
	Interest, unclaimed, . .	707	9	8
	To sundry balances due to different persons, . .	1,997	6	3
		L.1,353,157	2	10

Cr

1833.		L.	s.	d.
June 24.	By cash in the hands of A. Heywood, Sons, & Co. Bankers, ...	L.40,397	2	3
	In the hands of Treasurer, .	613	2	10
	By balances due in sundry open accounts, ...	22,317	15	4
	By amount of materials unexpended, ...	62,820	14	3
	By balance, ...	1,227,008	8	2
		L.1,353,157	2	10

The debt due by the trustees, 24th June 1833, was L.1,353,157. 2s. 10d., and the income on an average amounts to nearly L.180,000 per annum.

Trade and Commerce. The countries with which the extensive commerce from Liverpool is carried on, could be best exhibited by shewing the arrivals and departures of vessels in a series of years; but, as such accounts would be long, and to many uninteresting, one year is selected to shew in what proportion the arrivals have been from the various quarters of the globe. The year 1832 is selected because it was one of about an average trade.

An Account of the number of Ships that entered the Port of Liverpool in the year 1832.

Countries.	British.		Foreign.	
	Vessels	Tonnage.	Vessels.	Tonnage.
Europe generally,.....	388	53,658	449	82,424
Africa, ...	93	23,379	1	100
Asia, ...	56	19,498	...	...
British Nor. America.	421	131,288	...	...
British West Indies,.	186	49,885	...	...
Foreign ditto,..... ...	14	2,456	1	200
United States, ...	210	70,392	365	142,165
Sou. American States,	145	31,249	1	78
Guernsey, Jersey, &c.	33	2,480	1	250
Isle of Man, ...	173	8,648	10	1,870
Coasters, ...	4,856	349,693	...	...
Irish trade,...........	3,259	386,699	...	...
Total,...	9,834	1,134,325	828	227,087

In order to shew the commercial importance of Liverpool in comparison with that of the other larger ports of this kingdom, the following statements are exhibited:—

Ports.	Number of Ships.	Tonnage.
London,................	2663	572,835
Newcastle,............	987	202,379
Liverpool,.............	805	161,780
Sunderland,...........	624	107,628
Whitehaven,..........	496	72,967
Hull,....................	579	72,248
Bristol,.................	316	49,535
Yarmouth,.............	585	44,134
Whitby,................	258	41,576

The following are the number of vessels, with their tonnage, which arrived in the years 1835 and 1836:—

Year.	Number of Vessels.	Tonnage.
1836,.......	14,959	1,947,613
1835,........	13,941	1,768,426
Increase,	1,018	179,187

As the business of the shipowner is not an accurate criterion of the commercial importance of places, neither is the amount of custom duties an actually certain standard. The imports of articles which are brought from one part of the United Kingdom to another, and consequently pay no duty, may cause an enormous trade, and be highly beneficial, but nothing of it would appear in the returns of the amount of duty collected at the custom-house. Although we exhibit the means of making comparative estimates, yet, in the case of Liverpool, the imports from Ireland must not be omitted to be recorded in taking a view of the state of its trade. It appears that their imports of agricultural products alone, consisting of live cattle, corn, flour, malt, bacon, pork, beef, hams, butter, hogs-lard, and eggs, amounted, in 1832, to L.4,444,500, 6s.; in 1833, to the estimated amount of L.8,179,844, exclusive of linen, feathers, hides, wool, and porter, to at least the value of L.50,000 of the latter article.

The quantity of Wheat sold in Liverpool from 1825 to 1834, is also given to shew its importance as a wheat market:

Quarters sold.

1825,	1826,	1827,	1828,	1829,
8,913.	3,527.	27,703.	93,516.	177,197.
1830,	1831,	1832,	1833,	1834,
150,010.	119,118.	168,170.	153,632.	155,155.

The number of bales of cotton imported into Liverpool, in the year 1835, from the United States, were, 491,271 bales in 396 foreign ships, and 180,870 bales in 157 British ships.

An Account of the net produce of the duties of Customs, as remitted from the several parts of the United Kingdom, in the years ending 5th *January* 1835 *and* 1836.

	1835.			1836.		
London,	L.9,576,972	1	0	L.10,601,600	5	8
Liverpool, .	3,622,310	11	11	4,044,894	18	8
Bristol, . .	998,002	0	4	1,120,808	1	4
Hull, . .	650,764	14	4	689,573	18	6
Dublin, . .	691,057	5	10	844,559	3	9
Greenock, .	350,167	12	5	316,575	4	8
Newcastle, .	271,287	19	10	275,369	9	4
Leith, . .	267,653	3	8	373,954	6	11
Glasgow, .	263,944	12	2	303,317	0	5
Belfast, . .	259,962	13	8	326,179	9	10
Cork, . .	166,132	18	8	185,866	18	2
Port-Glasgow,	107,466	1	6	112,696	14	5
Waterford, .	113,009	18	8	123,861	15	6
Gloucester, .	126,067	10	10	155,158	12	3

The Gross and Net Amount of the Duties collected at Liverpool Custom-House in the years ending 5th *January* 1834 *and* 1835.

	Gross Receipt.			Net Receipt.		
1834,...	L.3,733,166	8	10	L.3,540,472	14	1
1835,...	3,846,306	9	11	3,622,310	11	11

The salaries paid to the officers at the Custom-House for 1835, were L.46,447 : 18 : 0 ; and the incidental expenses amounted to L.47,541 : 3 : 7.

The vast extent of the commerce of Liverpool, as here in some measure exhibited, has in a great degree been indebted for its progress to the capital, the skill, and the industry of the inhabitants of the counties in its vicinity, as well as to the convenience of its port and its docks. With these counties the facilities of intercourse have been constantly advancing, chiefly by the numerous internal canals which branch out from the river Mersey. One of these, the Leeds and Liverpool, which brings Hull, by the Aire, in communication with the Mersey, forms a way for conveying the woollen and cotton goods made in the West Riding of Yorkshire to the great shipping port for America, where are the greatest number of the consumers of them. In the course of this canal, either by direct or indirect communication, it is brought in contact with the manufacturing towns of Wigan, Chorley, Preston, Bolton, Blackburn, and Rochdale, in Lancashire, and with Halifax, Huddersfield, Bradford, Leeds, Wakefield, Barnsley, and Sheffield, all towns of great manufacturing activity. By the Duke of Bridgewater's canal from Runcorn, Liverpool is brought into direct contact with Manchester and Stockport, and with that vast mass of coal on the duke's estate, which could easily supply the whole fuel for these and the surrounding populous places, but it is surprising how little of that valuable commodity comes down to Liverpool by the canal. By the Grand Trunk Canal, the Mersey is supplied with the rock and refined salt, both articles of very great export, from the towns of Middlewich and Northwich, in Cheshire ; and the cheese of that county is by the same channel brought to be shipped for London, and other ports of the southern divisions of the kingdom. The same canal passes Staffordshire, from the northern part of which the potteries of Burslem, and the large new built towns in its vicinity, convey thousands of crates of their ware annually, which are dispatched from Liverpool to all parts of the globe ; whilst, in its progress to the south, it touches Wolverhampton, the head-quarters of the heavy iron manufactory ; and then, by other canals to Birmingham, with its innumerable articles of hardwares of which every country in the world receives a portion. The canal navigation to the south joins the two great rivers, the Severn on the west, and by the Grand Junction with the Thames on the east ; and thus a water communication is maintained internally with almost every part of the south of the kingdom.

Corporation Revenues.

The annual revenue of the corporation in 1793 was L.25,000, which, valued as capital, was estimated at L.1,044,766. The debts due by the corporation were also valued and found to amount to L.367,816, 12s., leaving a balance in favour of the corporation of L.676,959, 8s. The revenues have, since that period, materially increased in value. The income is now about L.150,000 per annum, and the debt is upwards of a million.

The most abundant source of revenue to the corporation is in the town-dues,—a rate levied generally on all merchandise imported or exported into or out of Liverpool. Freemen are exempted from this tax. The following table shews the amount of the town-dues every tenth year from 1731 to 1831, each year ending 12th of October :—

1731 .	L.648 16 3	1791, .	L.10,440 11 2
1741 .	1,163 9 2	1801, .	19,728 3 5
1751 .	1,338 1 5	1811, .	21,418 5 3
1761 .	2,162 7 10	1821, .	33,090 5 6
1771 .	2,899 11 8	1831, .	35,176 12 6
1781 .	4,479 15 8		

State of the Poor.

There are few towns which have their parochial concerns of such magnitude as Liverpool, or have the affairs connected with it better conducted.

The Workhouse, perhaps the largest in the kingdom, was erected in 1771, but has been much enlarged since that period. The paupers in it are well supplied with the necessaries of life, and the aged amongst them are allowed many additional comforts. All that are not sick are employed in some trade or useful manufacture, such as joiners, blacksmiths, wheel-wrights, shoemakers, tailors, &c., but their labour is not very productive. The boys are instructed in some trade, and the girls above nine years of age are taught to knit, sew or spin, to make straw bonnets, or to weave calicoes or other cloth.

The local taxes for this and other purposes, assessed and collected in Liverpool, are shewn by the following table, and clearly prove that neither pauperism nor taxation have increased in the same ratio as the population, and, it may be presumed, not in the same ratio as the wealth.

Table to shew the number of the Poor, their Maintenance, the annual Parochial Assessment, Rental, Receipts, Expenditure.

Year.	Number of Poor in the Work-house.	Whole cost of their maintenance.	Average weekly number of out-door Poor.	Whole cost of their maintenance.	Number of houses assessed.	Rates on the whole rental.	Amount of the rent of the houses.	Amount of the rates.	Amount received.	Expenditure.
1828	1411	L.10,259	1070	L.10,034	26,253	L.0 2 6	L.530,623	L.66,327	L.50,844	L.42,870
1829	1533	11,359	1291	11,793	27,023	0 2 0	548,218	54,821	42,127	43,582
1830	1606	14,288	1442	13,906	27,791	0 2 0	568,531	56,853	43,637	51,899
1831	1648	13,790	1635	14,922	30,320	0 1 9	695,759	60,879	45,788	51,725
1832	1715	13,971	1980	17,534	32,554	0 2 6	854,587	106,872	80,000	62,415
1833	1792	15,981	2083	18,624	33,032	0 2 1	790,515	82,367	61,200	58,980
1834	...	...	...	...	33,222	0 2 1	801,964	83,660	62,500	54,201

The valuations of the several premises were, in the years 1820, 1821, and 1822, about equal to the rack rent. From 1823 to 1830 they were about four-fifths of the rack rent, and from 1831 and 1834 they were nearly equal to the full value.

The proportion of these rates, which are actually collected, has varied in different years between 70 and 74 per cent. of the amount assessed.

Iunicip overn- ent.

The corporation, which is one of the most ancient and wealthy in the kingdom, has been altogether remodelled by the Muncipal Reform Bill. Previous to the passing of the act, the Body-Corporate consisted of forty-one persons, chosen by the freemen of the borough. These formed the common-council, and from amongst whom were chosen annually a mayor and two bailiffs : vacancies were filled up by the members of the council, as they occurred. By the Municipal Reform Act, the old corporation was abolished, and the town was divided into sixteen wards, returning forty-eight councillors and sixteen aldermen, who are to be elected on the 9th of November by the resident rate-payers. The councillors remain in office for three years. The mayor is elected from amongst themselves; the whole corporate body being thus sixty-four. They are required to meet quarterly, but they generally meet once a month, and often more frequently. The council is empowered to enact laws for the better regulation of the police of the town, of the port, and of the dock, as well as for watching and lighting of the town, and other public purposes.

Since the accession of the new council to office, a new and improved system of police has been formed; old laws have been consolidated; and preparations are now making to extend to the new extended borough, the advantages enjoyed by the inhabitants of the old. There are twenty-nine justices of the peace for the borough of Liverpool.

At the registration of 1836, the total number of persons qualified to vote for members of parliament was 10,600.

Adjoining districts.

The districts in immediate communication with Liverpool have within the last thirty years increased from 2,000,000 inhabitants to 3,600,000; and there can be no doubt but that their wealth has been augmented in a still greater ratio. It has, too, been brought into indirect communication with a much larger district, as the advance extends the limits of supply at every step on both sides its course. The increase of the import trade, or of foreign commodities, including colonial, is thus very naturally acounted for.

Markets.

The recent introduction of steam navigation has been extended amply to Liverpool, and been found of the greatest benefit. In the supply of the markets with every kind of provisions from the adjoining districts on the shore, but especially from Ireland, the accuracy of their arrival when loaded with perishable products, has had a manifest good effect in reducing their prices. Steam-boats are constantly passing between the Mersey and the ports of Ireland, of the Isle of Man, of Scotland, and of North Wales. They are used at the ferry to the city of Chester, and, in contrary winds, to tow vessels into or out of the river. The celebrated rail-road, with its steam-carriages, between Manchester and Liverpool, has given a wonderful impetus to communication. A particular account of this railroad will be given under the article Manchester.

No place can be better supplied, or at lower rates, with all the necessaries and comforts of life, than Liverpool. Water, one of the first of those necessaries, is furnished by two companies. It is raised by steam-engines to the due height, to convey it to the upper floors of the dwellings. They also supply large reservoirs and many tanks, in different parts, which have always abundance of water ready to extinguish fires.

It has been observed that the markets are well supplied; to which may be added, that they are well calculated for the display and preservation of the commodities, by the appropriate nature of the buildings. The most extensive market is St John's, containing an area of 8235 square yards, being 183 in length and 45 in breadth. It is very light and clean, and at night is lighted by gas. The roof is lofty, supported by cast-iron pillars, and against the walls are nearly sixty small shops, eighteen feet long, and twelve feet wide, with a fireplace in each. There are besides upwards of 500 stalls or compartments, allotted for the exhibition of vegetables, eggs, poultry, fish, fruit, and potatoes, and on the basement thirty convenient storehouses. The whole is supplied with pumps of hot and cold water, and every evening the floor is swept and washed, and then shut up under the care of watchmen. The regulations for weighing, or otherwise ascertaining the quantities of the articles sold, are simple and cheap; as are those for the regulation of the porters, who are known by a badge, and carry the purchases from the market to the residence of the buyers. It is perhaps the best and neatest market of any city in Europe. There are others. St James's market is neat, but has an area of only 3000 yards. At the end of the same street is a commodious fish-market, opened in 1826. A new market, with an elegant front, has been built in a situation convenient for those in the neighbourhood of Scotland Road; and besides these are Islington, Pownal Square, and Cleveland Square Markets; one for hay and cattle in Lime Street, and one for pigs in Great Howard Street. There is a market for live cattle three miles from the town on the London road.

Streets and Buildings.

The streets in the centre of the town are generally narrow, and rather gloomy in their appearance; but many of the recently-built portions are handsomely, and some elegantly arranged, and contain very excellent houses. There are abundance of good hotels and inns. The streets are well paved, and lighted with gas furnished by two companies; and the police, for the preservation of the peace and of cleanliness, is well arranged. The public buildings deserve notice. The first of these, in point of extent, is the Town-Hall, built on the site of a former one which was consumed by fire in 1795. It is of a quadrangular form, with a rustic basement, on which rises a range of columns and pilasters, having rich and finely-finished capitals. Between the pilasters are handsome well proportioned windows, with semicircular heads. On the western and southern sides the spaces between the capitals are ornamented with various designs, executed in bas-relief, emblematic of commerce. The whole is surmounted with a large and stately dome, in strict keeping with the rest of the building, and supporting a massive figure of Britannia in a sitting posture. The principal entrance is through a portico, which leads to a splendid staircase, illuminated from above in a manner to produce a highly pleasing effect. It is adorned by a fine white marble statue of the late Mr Canning, by Chantrey. The principal story is laid out in a fine saloon, two drawing-rooms, and a ball-room of great dimensions; and in the former are excellent portraits of his present Majesty William IV., when Duke of Clarence, by Shee; of George III., by Sir Thomas Lawrence; of George IV., when Prince of Wales, by Hopner; and of the late Duke of York, by Philips. The painting and other ornamental finishing of the apartments, as well as the furniture, are tasteful and appropriate, and executed at an expense becoming the liberality of the second commercial city of the world. The dome has a gallery surrounding it, whence a very fine view may be obtained of the whole of the river and docks, and of the country around.

This building forms one side of another mass of erections, executed about twenty-five years ago, for the purpose of an Exchange. It is of great extent, being 197 feet long and 178 broad, thus forming a quadrangle of 3500 square feet, being nearly double the space occupied by the area of the Royal Exchange in London. It has upon one side a finely-proportioned Doric front, with three rusticated arches, one forming the entrance to a large and splendid vestibule, composed of thirty-two columns, from which spring richly ornamented groined arches. The architectural beauty of this arcade attracts universal admiration. In the eastern wing is the new room 94 feet in length and 51 in width, in which are to be found the papers relating to knowledge in general, of either politics or commerce, that are issued in the several countries of the globe. Over this is another apartment, used by the insurance-brokers and underwriters, where insurances of shipping are effected. The rest of the building is used as offices, and the exterior consists of large and convenient warehouses.

In the centre of the area a splendid bronze monument to the memory of Lord Nelson was erected in 1813. It stands on a circular marble basement, at the top of which is the principal figure, in an erect attitude, receiving from Victory a fourth naval crown, whilst Death is aiming the fatal blow from under the folds of the enemy's flag, whilst a sailor is seen grasping a battle-axe about to revenge the death of a hero, and Britannia leaning on her spear, with laurels in her hand, seems overwhelmed with a sense of her loss, and apparently regardless of her glory. The pedestal is beautifully adorned with designs in bas-relief, descriptive of some of the admiral's great naval battles. The whole is a fine piece of workmanship, executed by Westmacott, from a design by Wyat, and the expense, about L. 9000, was collected by public subscription.

The Sessions-house is a fine building, with a front of 174 feet in length. Its architecture is a specimen of simple elegance, whilst the interior is skilfully contrived to form an excellent court of justice, with easy access, and appropriate places for the magistrates, council, attorneys, witnesses, jurors, and prisoners. It contains also convenient apartments for committees, and a gallery for auditors.

A new custom-house was begun to be erected in 1828, and is now nearly finished. It is a large and magnificent building of fine freestone, of the Ionic order of architecture. It is composed of three façades rising from a rusticated basement. The portico on the north front forms the principal entrance, and is 470 feet in length, and the wings from north to south are each 220 feet. When the interior is finished it will be one of the most convenient, as it now is one of the most splendid edifices in the kingdom; and the Excise-office will be removed to and occupy a part of it, which will give great facility to both the revenue departments, as well as to the merchants and masters of the trading vessels.

The Dock-office, the Public Baths, where cold, tepid, vapour, and sulphur baths are always ready; the Corn-exchange, where sales of grain are made; are all, as buildings and as conveniences, worthy of observation.

The whole town of Liverpool constitutes but one parish. The mother church, dedicated to St Nicholas, is said to be on a site with a chapel built at the time of the Norman Conquest, but to have been kept by repairs in a state for public worship till 1774, when it was rebuilt. It is chiefly to be noticed on account of an accident which happened to it in 1810. Whilst the bells were calling the congregation to the morning service, the tower fell down upon the body of the church. Few adults were yet seated, but the children of a charity school had entered when the tower fell. Twenty-eight persons were taken out from among the ruins, of whom twenty-three were dead, or expired soon afterwards, and seventeen were of the charity children. A new tower has since been erected, in the ornamental Gothic style, which is a fine object, 180 feet high, and furnished with a peal of twelve bells.

Besides this there are twenty-seven other churches, and two chapels, in the Docks, for the adherents of the established religion. Many of them are elegant, most of them recently erected, and all commodious and spacious. They are capable of seating from 1200 to 2000 persons each, and in most of them the free sittings bear a very great proportion to the whole of the seats. In one of these, St David's, the service is performed in the Welsh language.

If our limits allowed it, many of these would be entitled to elaborate descriptions, but it can only here be said that, in combination with their spires, they produce a very striking effect on the appearance of the place, whether looked at in walking the streets, or viewed from the gallery of the Town-Hall, or any similar height. Some other churches are now building or projecting.

The several classes who differ from the established religion have their respective places of public worship. The Roman Catholics have five chapels, one of them a handsome Gothic edifice in Hawk Street, and another, equally spacious and neat, in Seal Street; the remainder are less striking, and are attended chiefly by the Irish of the lower classes. There are two churches of the Scotch establishment, and two for seceders from it. The Wesleyan Methodists, including their several sections or subdivisions, have twelve places of worship; one in Pit Street is large and commodious, and furnished with an organ; another in Moss Street is spacious, with rows of seats one above another like a theatre. The others, though of somewhat less dimensions, are neat and clean. The Independents have five chapels, one of which, the largest, in Great George Street, is a very spacious building, capable of seating 2000 persons; and being very commodiously arranged, the galleries contain nearly 1000 children of a Sunday school. One of the other chapels belongs to the Welsh Independents. There are eight chapels belonging to the different sections of Anabaptists, three to Welsh Calvinists, two to Unitarians, one each to the Quakers, to the Sandemanians, and the Swedenborgeans, and the Jews have also a synagogue. There is also a place of public worship for converted Jews. Several of the places of worship have their separate burying-grounds, and most of them, like all the churches of the established religion, have charity schools, either on Sundays or week days, or both.

Very few of the churches have burying-grounds attached to them, but an extensive cemetery has been formed, with the chapel of St James's within it for reading the funeral service. The ground contains 44,000 square yards, and was originally the stone quarry from which much of the materials for the buildings of the town was drawn. It is laid out with taste, and kept in good order, and recently a handsome house has been erected for the officiating minister. There is another cemetery at Low Hill, which is open for the entombment of persons of every religious denomination.

Besides the institutions for communicating religious instruction, Liverpool is not deficient in others for the promotion of general knowledge, and the diffusion of a taste for the fine arts, and other objects which give grace to human society. One of these is the Liverpool Royal Institution in Colquit Street. It was first opened in 1817, with an appropriate address from that celebrated and estimable native of the town, the late William Roscoe. On the ground-floor there is an elegantly furnished reading-room, ornamented with several ancient paintings, formerly part of Mr Roscoe's collection, the production of the early masters, shewing the progress of the art to the commencement of the fifteenth century. The apartment is provided with a library, and most of the periodical works. In connexion with it is a lecture-room, 30 feet by 50, with seats for pupils in an ascending order. The upper stories are formed into a museum, containing collections of natural history, casts of the Elgin marbles, and of other Grecian antiquities, and a few specimens of statuary.

There are other institutions for the diffusion of knowledge, which may be noticed without entering into the minute details of their more peculiar objects. These are the School of Arts for the benefit of the artizans of the town; the Athenæum, a library of 14,000 volumes, with a news-room; the Lyceum, with a library of 30,000 volumes, and a spacious and elegant news-room; the Union News-room, with a select library, and an apartment used as a school of arts, in which lectures are delivered; the Apprentices' Library, and the Law Library, whose names designate the purposes to which they are applied. The Blue-coat Hospital was founded 125 years ago, and then maintained, taught, and clothed 40 boys and 10 girls, and the number is now increased to 350 of the two sexes. There are besides upwards of twenty free day-schools, mostly supported by bequests from, or subscriptions by, the members of the Established Church, and the children are instructed in the doctrines and worship adopted by it. One of these is a Welsh school, with 300 boys and 100 girls. The dissenters of every class are not behind their neighbours in providing means of education for the poorer members of their communion. The Wesleyan Methodists have more than 1000 children in the schools connected with their chapels, and the other sectaries display an equal degree of zeal, in proportion to their numbers, in this cause. There are six infant schools established, where those too young to receive much instruction are amused, kept from mischief, and are taught to acquire docility before they become prepared to enter the free schools.

The Infirmary is a public hospital, open to patients of every age, country, complexion, or creed. It is a fine building, capable of receiving 220 patients, if its funds were more ample than they are at present, of which the expectation is sanguinely indulged. There are two dispensaries, where advice from the ablest medical men can be obtained, and where medicines are supplied gratuitously every day. There are besides, a lunatic asylum, two ophthalmic institutions, an institution for relieving diseases of the ear, a marine humane society, an institution for teaching the deaf and dumb, a female penitentiary, and above all, the Blind Asylum, in which 120 beings are maintained and instructed, and occupied in such employments as are suitable to their melancholy condition.

Like other large towns, Liverpool has its places of amusement. The Theatre-Royal was built in 1772, and was enlarged in 1803. There is also an amphitheatre for equestrian and pantomimic performances, which open in some months of each year. A little but neat theatre has also been built in Church Street, for exhibiting dramatic pieces.

The Wellington Rooms, opened in 1816, are adapted for balls and for public dinners, or other social assemblies, having a ball, supper, and card room of elegant appearance, and tastefully furnished.

See Baine's Valuable History of Lancaster.

Liverpool, *Charles Jenkinson, first Earl of,* was the eldest son of Colonel Jenkinson, the representative of a family which had been settled at Walcot, near Charlbury, Oxfordshire, for above a century. Mr Jenkinson received his education at the Charter-house School, and at the University of Oxford. In early life he published verses on the death of Frederick prince of Wales, a dissertation on the establishment of a national and constitutional force in England, independently of a standing army, and a discourse on the conduct of government respecting neutral nations. In 1761, having obtained an introduction to the Earl of Bute, he became one of the under secretaries of state, and in the same year was returned to parliament for Cockermouth. In 1763, he was appointed joint secretary to the treasury, and having shared with Lord Bute the marked favour of his majesty George III. he, on that nobleman's sudden retirement from office, became a conspicuous member of the party then commonly called the King's Friends. On the accession to power of the Rockingham administration, in 1765, he resigned his public appointments; but about the same period he was nominated auditor of accounts to the Princess-dowager of Wales. In 1766 he was appointed a lord of the admiralty by the Grafton administration; and the following year he became a lord of the treasury. Under Lord North's government new honours awaited this steady aspirant for promotion. In 1772, he was appointed one of the vice-treasurers of Ireland; and, in 1775, he was allowed to purchase the patent office of clerkship of the pells in that country. He afterwards succeeded Lord Cadogan as master of the mint; and, in 1778, he became secretary at war. In 1783, he became a member of the Board of Trade; and, in 1785, he published his Collection of all the Treaties of Peace, Alliance, and Commerce, between Great Britain and other Powers, from the treaty of Munster in 1648 to the treaties signed at Paris in 1783. In 1786, he was made chancellor of the duchy of Lancaster; called up to the House of Lords by the style and title of Baron Hawkesbury of Hawkesbury, in the county of Gloucester; and appointed president of the Board of Trade. The commerce of the country formed a prominent object of attention to Lord Hawkesbury, and though his theoretical views were confined, his practical knowledge was extensive. He is said to have drawn up the commercial treaty with America, and to have facilitated the establishment of the South Sea fishery, to which he had been the first to direct the attention of the government. In 1796, his personal honours were carried *au comble* by his advancement to the dignity of Earl of Liverpool. His lordship was twice married, and had two sons and a daughter. After obtaining his earldom, he rarely quitted his retirement; but whenever he spoke in the House of Peers, the extent and accuracy of his information, particularly on commercial subjects, procured him marked attention. In 1805, he addressed a letter to the king on the coins of the realm, containing a concise and distinct statement of most of the facts deserving of notice in the history of British coinage. Lord Liverpool died on the 17th of December 1808. (A.)

Liverpool, *Robert Banks Jenkinson, second Earl of,* son of the preceding, was born on the 7th of June 1770. At an early age he was placed at an academy at Parson's Green, near Fulham, where he remained until his thirteenth year; he was then removed to the Charter-house School, where he continued between two and three years; and soon after leaving the Charter-house, he was entered as a student at Christ Church College, Oxford. Here he became acquainted with Mr Canning, the most distinguished of his contemporaries, and formed for him a friendship which proved of an unusually permanent character, and had more than once an important influence on the fortunes of Mr Canning's public life. About the period of the breaking out of the French revolution, Mr Jenkinson paid a visit to Paris, and was in that capital when the Bastille was demolished. This sudden ebullition of popular fury against one of the strongholds of tyranny, and some other excesses which he is said to have witnessed in the streets of Paris, appear to have excited in his mind apprehensions which clouded his judgment, and led him to form the most distorted and incorrect notions of the events which the progress of the revolution evolved in France. Soon after his return to England, he was introduced to parliament as one of the representatives of Rye, and took his seat under the avowed patronage of the minister, Mr Pitt. On the 27th of February 1792, he made his first speech, in opposition to certain resolutions proposed by Mr Whitbread, on the subject of the claim urged by the Czarina Catherine to the fortress of Ockzakow and the adjoining territory. His address was praised as manifesting considerable knowledge of the question in dispute, as well as of the affairs and prospects of Europe generally; and as the protégé of a powerful minister always finds indulgent critics, it was prognosticated that Mr Jenkinson would rise to be a distinguished parliamentary speaker, and an efficient member of the British cabinet. His next public appearance was one which reflects no honour on his memory. His father had been one of the opponents of the abolition of the slave-trade in the House of Commons; and the son was scarcely warm in his seat in the House of Commons, when he joined the ranks of those who, without venturing to defend the principle, sought to perpetuate the practice of this enormous iniquity. On the 2d of April 1792, Mr Wilberforce moved, in a committee of the whole house, " that the trade carried on by British subjects for the purpose of obtaining slaves on the coast of Africa, ought to be abolished." This was met by an insidious suggestion of Mr Dundas, who proposed to insert the word "gradually," before the word "abolished;" but Mr Jenkinson, whose zeal was too hot to be satisfied with mere evasion, moved "that the chairman should leave the chair." The amendment was, however, rejected by a large majority, and Mr Dundas's more adroit proposition agreed to. Never, perhaps, was so much splendid oratory displayed in the House of Commons, as in the debate which followed on Mr Wilberforce's motion.

Mr Jenkinson's next appearance was in a more prominent and less questionable position. The king of France had been deposed, and the British ambassador, Lord Gower, recalled. On the 15th of December 1792, Mr Fox moved an address to the king, praying that a minister might be sent to Paris to treat with the provisional government of France, touching such points as might be in discussion between his majesty and his allies, and the French nation. In the temporary absence of Mr Pitt, who had vacated his seat by accepting the wardenship of the Cinque Ports, Mr Jenkinson replied to Mr Fox, in a speech which, though warmly complimented by Burke, is more remarkable for rambling and vehement declamation, than any quality of a higher order. Mr Fox was much more effectually answered by an overwhelming majority. His motion was negatived without a division. In April 1793, Mr Jenkinson was appointed one of the commissioners of the India Board; and on the 6th of May he stood forward in opposition to Mr Grey's memorable motion on the subject of parliamentary reform, defending the state of the representation as it then stood, and maintaining that the House of Commons, constituted as it was, answered all the ends for which it had been designed. On the 6th March 1794, he opposed Mr Grey's motion for an address to the king, expressive of the concern of the House that his majesty should have formed an alliance with powers whose apparent aim was to regulate the affairs of a country with which they had no right to interfere. On the 10th of April, he undertook a more difficult task, namely, to justify the measures of the ministry, and to palliate the failure of the army commanded by the Duke of York at Dunkirk. Mr Jenkinson was long twitted in parliament and elsewhere, with an observation which fell from him on this occasion. He declared that "the marching to Paris was attainable and practicable; and that he, for one, would recommend such an expedition." The ridicule which this excited was unbounded; it became a stock topic of derision. "The conquest of France!" says Mr Fox, in his letter to the electors of Westminster. "Oh, calumniated crusaders, how rational and moderate were your objects! Oh, tame and feeble Cervantes, with what a timid pencil and faint colours have you painted the portrait of a disordered imagination!" Yet, such are the accidents of war and fortune, Mr Jenkinson, contrary to all human probability, lived to see his notion realized; and what seemed, in the year 1794, like a sick man's dream, or the vision of a disordered imagination, was effected in 1814, and repeated in little more than a year afterwards. On the 30th of May 1794, he made one of his best efforts, in opposition to Mr Fox's motion for putting an end to the war with France. This was perhaps the most active period of his life.

In the next session, Mr Jenkinson was absent from his place in parliament, love having superseded politics. On the 25th of March 1795, he married the third daughter of the Earl of Bristol and Bishop of Derry. At the opening of the session of 1796, the address was seconded by Mr Stewart, afterwards Lord Castlereagh, in the first speech delivered by him in the House of Commons. He was answered by Mr Sheridan, who strongly censured ministers, at the same time advising them to declare themselves willing to treat with the French republic. Mr Jenkinson replied to Mr Sheridan, repeating his former arguments in justification of the government measures. Upon commercial subjects Mr Jenkinson entered with confidence, conceiving, perhaps, that he had some claims to "hereditary knowledge." On Mr Grey's motion in the House of Commons (10th of March 1796) for an inquiry into the state of the nation, he descanted on the effect of the war upon our commerce, contending that, notwithstanding its pressure, the situation of Great Britain, in a commercial point of view, was more prosperous than at any preceding period. On the 28th of May 1796, Mr Jenkinson participated in the honours of his family, exchanging its surname for his father's second title of Lord Hawkesbury. When the great measure of the legislative union with Ireland was proposed, it received his entire concurrence. The subject was introduced by a message from the crown, on the 22d of January 1799; and, in the discussion which ensued, Lord Hawkesbury warmly supported the views of government respecting it.

The circumstances which attended the temporary retirement of Mr Pitt from power early in 1801, are too well known to render it necessary to say any thing respecting them. In the new ministry, the formation of which was announced on the 14th of March, with Mr Addington at its head, Lord Hawkesbury was appointed to the office of secretary of state for the foreign department, and took a prominent part in the debates which ensued. The great business of the succeeding summer and autumn consisted in the adjustment of preliminaries of peace with France. Lord Hawkesbury, as foreign secretary, was of course intrusted with the interests of Great Britain in the negotiations which followed the signature of the preliminaries; and, on the 28th of March 1802, a definitive treaty of peace was concluded at Amiens between the French republic, the king of Spain, and the Batavian republic, on the one hand, and the king of Great Britain and Ireland on the other. In the important debate on this peace, which took place on the 13th of May 1802, Lord Hawkesbury defended the treaty at great length, in a speech which was considered as the ablest that had been delivered in either house of parliament on the ministerial side. He also distinguished himself by the part he acted in reference to the remonstrances of the First Consul respecting the strictures made on his person and conduct by the newspaper press of Britain; and, in the correspondence which ensued with M. Otto, he ably vindicated the public character and liberties of his country. The evil complained of, though certainly calculated to keep alive national animosities, and to provoke a renewal of the war, was not one for which the government could afford any redress. The constitution of this country admits of no previous restraint upon publications of any description. But there exist judicatures, wholly independent of the executive government, capable of taking cognizance of such publications as the law deems to be criminal, not only of libels against the government and magistracy of this kingdom, but also of publications defamatory of those in whose hands the administration of foreign governments is placed To these the French minister was with strict constitutional propriety referred. For, as the government of this country neither enjoys nor requires any other protection than that which is afforded by the laws, it could never be expected to consent to new-model laws, or to change its constitution, in order to gratify the wishes of a foreign power. In October, Lord Hawkesbury, in his turn, remonstrated against the occupation of Switzerland by the French under Ney, in order to enforce the reception of a new constitution for that country, prepared by the First Consul in his own cabinet. This he did in a note addressed to M. Otto, in which he expressed the deep regret excited in the breast of his majesty by the proclamation of the First Consul to the Helvetic people, and declared that his majesty could view the recent exertions of the Swiss cantons in no other light than as the lawful efforts of a brave and generous people to recover their ancient laws and government, and to procure the re-establishment of a system not only favourable to their domestic happiness, but perfectly consistent with the tranquillity and security of other powers.

At this period, the management of the House of Commons had, in a great measure, devolved on Lord Hawkesbury, who, of course, spoke on every topic involving the character of the administration, as well as on the political questions which were brought under the consideration of the House of Commons. At the opening of next session, he was called to the House of Lords by writ, as a peer's eldest son; but the only measure of importance which in that session he brought forward in the new situation in the legislature where he had been placed to defend the measures of ministers, was the volunteer consolidation bill. About the same time, he addressed a circular to the ministers of foreign courts resident in London, disclaiming indignantly the charge that his majesty's government had been a party to plans of assassination, and describing the recent seizure and execution of the Duke d'Enghien as "a sanguinary deed, perpetrated by the direct order of the First Consul, in violation of the rights of nations, and in contempt of the most simple laws of humanity and honour." That the British government were innocent of the crime imputed to them, is beyond a doubt. But, on the other hand, it cannot be denied that the life of the First Consul had been openly attempted in the streets of Paris; that Pichegru, Cadondal, and their associates, avowedly meditated assassination; that these conspirators had been landed on the coast of France by an English vessel, commanded by an English captain; that the English press continued to revile in unmeasured terms the head of the French government, if not to insinuate that taking him off would be a meritorious act; and that, consequently, appearances unhappily seemed to give some ground to the charge which the First Consul preferred against the government of the country, in justification of a deed which, however it may be viewed, was, if not the greatest crime, at all events the greatest error, he ever committed.

On the 12th of May, the administration was dissolved, by the resignation of Mr Addington; Mr Pitt returned to the head of the ministry, and Lord Hawkesbury received the seals of the home department. The renewal of the war being now inevitable, the first effort of the new government was to place the military establishments of the country on a more enlarged and efficient footing; and with this view, Lord Hawkesbury exerted himself in the House of Lords in support of the additional force bill. At a later period of the session, Mr Wilberforce renewed his attempts to put an end to the detestable traffic in human flesh, and a bill for that purpose passed the House of Commons; but, on its transmission to the House of Peers, it was postponed, on the motion of Lord Hawkesbury, for more mature investigation in the ensuing session. The pretext was worthy of the cause in favour of which it was employed. On the 10th of May 1805, Lord Grenville moved the order of the day for taking into consideration the petitions of the Roman Catholics of Ireland. This motion Lord Hawkesbury also opposed. He would neither consent to break the fetters of the enslaved African, nor agree to remove the disabilities which placed millions of our fellow-subjects beyond the pale of the constitution. In the autumn of 1805, Mr Pitt retired to Bath, his health being then in a state of rapid decline. On the 11th of January 1806, he returned with difficulty to his house at Putney, where he died on the 23d, two days after the meeting of parliament. The death of Mr Pitt afforded Lord Hawkesbury an opportunity of placing himself at the head of the cabinet; but being well acquainted with the relative position and strength of parties, his ambition yielded to his good sense, and he declined the flattering offer. His majesty, however, appointed him to the situation of warden of the Cinque Ports, vacant by the death of Mr Pitt. On the return to power of that minister's friends in 1807, Lord Hawkesbury resumed his station in the cabinet as home secretary, and took a prominent part in defence of all the measures of government, particularly of the questionable expedition to Copenhagen, and the famous orders in council. Towards the close of 1808, Lord Hawkesbury was, by the death of his father, placed at the head of his family, as second Earl of Liverpool.

Lord Liverpool was the political heir of Mr Pitt, in all except his talents. Reposing a just confidence in the stability of our institutions, which had safely weathered the conflict with democratical principles, he adhered to the system of his early patron and master; and although Mr Pitt had died despairing of his country, Lord Liverpool was one of those who had the temerity or the courage to brave the concentrated power of imperial France, wielded by the most wonderful genius that any age or country has produced. True to the principle of eternal war with France, as long as a man sprung from the Revolution presided over her destinies, though the prospect was still dark, the immediate peril great, and the future shadowed out by portentous omens, he had still faith in the ultimate approach of a day of crowning triumph; and fortune at length smiled upon counsels which the ordinary inspirations of human wisdom had disclaimed. With these feelings, Lord Liverpool warmly advocated the cause of Spain, in the session which commenced on the 19th of January 1809. His doctrine was based upon the principle of tenacity. He contended that, according to all the lights furnished by history, nations, after maintaining such contests for ten or twenty years, have eventually succeeded, in spite of frequent and severe reverses, in securing the object which they struggled to attain. In a few days (23d January) he had occasion to move the thanks of the House of Peers to Lord Wellington for his conduct in the Peninsula. This motion especially related to the battle of Vimiero.

When the quarrel and subsequent duel between Lord Castlereagh and Mr Canning induced both to resign, and led the Duke of Portland to withdraw from his situation as nominal head of the administration, Mr Percival united in name, as he had already done in effect, the offices of first lord of the treasury and chancellor of the exchequer; and, in this new arrangement, Lord Liverpool became secretary of state for the war department. The illness of George III., the introduction of the regency bill, the difficulties which beset the prince regent in his endeavours to form a new administration, and his final determination to abide by Mr Percival, are all too well known to require any detail. In the two succeeding sessions the exertions of Lord Liverpool were unremitting, but not marked by any thing of prominent importance. At length, on the 11th of May 1812, Mr Percival fell by the hand of an assassin, leaving the ministry in so disjointed a state, that, after some abortive negotiations with the Marquis Wellesley and Lords Grey and Grenville, Lord Liverpool yielded to the request of the prince regent, that he would place himself at its head. The only additions made to the ministry upon this occasion were Lord Sidmouth, and Mr Vansittart, afterwards Lord Bexley.

The first important measure of Lord Liverpool's government was rendered necessary by the disturbances which had taken place in the manufacturing districts, where, owing to various causes, great distress prevailed; and it assumed the form of a bill to prevent the rioters from possessing themselves of arms, to guard against tumultuary meetings, and to give more extensive jurisdiction to the magistrates of the disturbed districts. Towards the close of the session, his lordship signalised himself by the explicit and unqualified opposition which he gave to a resolution proposed in the House of Lords by Marquis Wellesley, that the house would, early in the next session of parliament, take into consideration the state of the laws affecting the Roman Catholics. Upon this occasion the premier came boldly forward as the champion at once of injustice and intolerance. He would not consent that the question should be entertained in any shape, or that even so much as a hearing should be given to those who were suing to be relieved from the galling and ignominious stigma of bondage. He declared it to be a maxim of his political life, that, with respect to a great constitutional question, if a stand were to be made, it should be made *in limine;* and, in such a code of political morality as that which Lord Liverpool had espoused, there can be no doubt whatever that this is a maxim which Macchiavelli would have himself recommended as the only safe rule of conduct. When free scope is once allowed to formal inquiry, perseverance in injustice is no longer possible. On the 20th of September parliament was dissolved.

Meanwhile the transactions in Spain and the north of Europe were highly favourable to the cause of legitimacy. In the Peninsula, Ciudad Rodrigo and Badajoz had fallen; the victory of Salamanca had been followed by the advance of Lord Wellington on Madrid; the siege of Cadiz had been abandoned, and the whole south of Spain evacuated by the enemy. In the north of Europe events of a still more decisive character had occurred. The burning of Moscow, and the premature setting in of the frost, had sealed the doom of the French grand army; the former event had rendered retreat inevitable, and the latter soon converted that retreat into a scene of the most appalling horrors and disasters. What the fire had begun, the frost consummated; General Morosow did the work which General Kutusow could never have accomplished; and the Scythian wilderness was covered with the wrecks of that mighty host which had swept onwards in the proud confidence of superior power. These disasters became known in England during the bustle of the elections, and contributed to augment the public confidence in the war policy of ministers, which the elements had thus unexpectedly crowned with success.

The first session of the new parliament opened on the 28th of November 1812, and closed on the 22d of July 1813. The principal subjects brought under the notice of parliament were, the Marquis Wellesley's charge against the government, of not affording sufficient force to his brother; a proposition for granting relief to the Russians; an explanation of the causes of the rupture with America; the sinking-fund; the renewal of the East India Company's charter; and the treaty between Great Britain and Sweden; in the discussion of all which Lord Liverpool took part. The military campaign was one of still greater activity. Lord Wellington, after gaining the battle of Vittoria, taking San Sebastian, and blockading Pampluna, entered France, beat the French on their own ground, and fully established himself on the "sacred territory." In the north of Europe, where nations rather than armies assembled to combat the French, the campaign opened favourably for the allies; and the subsequent loss of the battle of Leipsig threatened the French emperor with utter ruin. The administration was duly sensible of the importance of the crisis. Parliament was assembled, principally to sanction loans of large amount to foreign powers; and before Christmas it was adjourned until the month of March. In the intoxication of victory, it was to the executive rather than to the legislative body that the eyes of the country were directed. The government had become omnipotent. The great events which followed were the entrance of the allies into Paris, the abdication of Napoleon, and the signature, on the 30th of May 1814, of a definitive treaty of peace between France and the allied powers. On the 24th of December a treaty was concluded at Ghent, which put an end to the unfortunate contest with America; and thus terminated a year as fortunate for Great Britain as any in her annals.

But the peace was destined to be short-lived. On the 20th of March 1815, Napoleon, having left Elba, landed in France, marched in a sort of triumphal procession to Paris, drove out the Bourbons, and replaced himself upon the throne, without firing a shot or spilling a single drop of blood. No sooner had intelligence of these astounding events been received, than messages were sent to parliament by the prince regent, and corresponding addresses moved by Lord Liverpool, who, in his speeches, dwelt much on the fortunate circumstance that Napoleon had undertaken his dangerous enterprise whilst the confederacy of the allies remained undisturbed, and they were still in a condition to act in concert. The result is universally known. Britain made gigantic efforts, both financial and military, to overthrow the man whom France had again placed at its head; and she was rewarded by the victory of Waterloo, where Napoleon drained the cup of misfortune to the very dregs. This was ere long followed by the treaty of Paris.

In the session of 1816 the principal subjects to which Lord Liverpool directed his attention were, the defence of the military establishment, explanations of the recent treaty, the transactions between government and the bank of England, and the state of the silver coinage. The meeting of parliament in 1817 was, from various causes, anticipated with much anxiety. The distress which prevailed amongst the manufacturers had produced disturbances in the inland counties, and a riot had occurred in the metropolis itself. The suspension of Habeas Corpus was proposed by the government; and Lord Liverpool had the unenviable task assigned him of defending that measure in the House of Peers. In seasons of distress, suffering naturally renders men credulous, and there are always persons ready to take advantage of this adjunct of misery; but there is too much reason to suspect that, in many instances, the starving people were first misled and afterwards betrayed by the agency of characters of a still more odious description, who were not altogether unknown to the government. The Catholic question having been brought under the consideration of the House of Lords on the 16th of May, by Lord Donoughmore, the premier restated his opinions concerning it, adding that "if the demands of the Catholics were complied with, the parliament would cease to be a protestant parliament." At a subsequent period of the session, ministers found it convenient to urge the continuance of the Habeas Corpus suspension act, which Lord Liverpool declared that he called upon parliament to vote, because "he considered the measure essential to the preservation of property and morality."

The death of George III. and the accession of George IV., who had already exercised the sovereign power for nearly eight years, made no change in the government, the ministers being immediately reinstated in their several offices. It is unnecessary to enter further into details, which more properly belong to the general history of the time. The principal affairs in which Lord Liverpool took a prominent and leading part were, the proceedings against Queen Caroline, particularly the bill of pains and penalties; the bill for the resumption of cash payments; the conduct of France and the allies in regard to constitutional Spain; the Catholic bill of 1825, with its two auxiliary measures, commonly termed "wings;" the state of the country, especially of the circulation, produced by the unexampled panic in the money market that followed the blind rage for speculation which distinguished the year 1825; the corn laws; and some other measures of less magnitude and importance. The Earl of Liverpool was in his place in the House of Lords on the 15th of February 1827, having brought down a message from the king recommending a provision for the Duke and Duchess of Clarence; and next day he moved an address expressive of the willingness of the house to comply with his majesty's request. This was the last occasion upon which his lordship appeared at his post. On the 17th he experienced an apoplectic attack, accompanied with paralysis, which at once prostrated both his mind and body; and, after lingering for a considerable time in a hopeless state, he expired in convulsive agony on the 4th of December 1828.

The public character of Lord Liverpool belongs to the history of that period, crowded with events of the greatest magnitude, during which he was either an influential member of the British government, or placed at its head; and he will be variously judged, according to the preconceived opinions of those who attempt to decide as to the character of that system of policy of which he was so long a prominent exponent. He was not a man of brilliant genius or excursive fancy, but he possessed useful talents, inflexible perseverance, and unimpeachable integrity, and towards the close of his life manifested a disposition to accommodate his policy to the advancing knowledge and opinions of the age. Excepting on a few points, he was perhaps the least bigoted and impracticable of the party which, after the death of Mr Pitt, recognised him as its head. As to his style of speaking, if it had little to recommend it in the form of eloquence, it commonly impressed the hearer with a conviction that the speaker was in earnest. He was vehement rather than energetic, and more noisy than forcible, but never intemperate. He entertained no angry feelings towards his parliamentary opponents; he never refused to others the tribute of applause which he thought they merited; and his gentlemanly deportment, unruffled by the rude collisions of party warfare, frequently disarmed his fiercest adversaries. In private life Lord Liverpool was justly respected for his amiable deportment and irreproachable conduct; sincere in his religious belief, and unobtrusive in the fulfilment of his duties as a member of society. We are far from entertaining any admiration of the principles of the minister, but it is a pleasing task to render homage to the virtues of the man. (A.)

LIVERY, in matters of dress and equipage, a certain colour and form of dress, by which noblemen and gentlemen choose to distinguish their servants. Liveries are usually taken from fancy, or continued in families by succession. The ancient cavaliers, at their tournaments, distinguished themselves by wearing the liveries of their mistresses. Thus people of quality make their domestics wear their livery. Father Menestrier, in his *Treatise of Carousals*, has given a very ample account of the mixtures of colours in liveries. Dion tells us that Œnomaus was the first who invented green and blue colours for the troops which, in the circus, were to represent land and sea fights. The Roman Catholic church has also her several colours and liveries; white, for confessors and virgins, and in times of rejoicing; black, for the dead; red, for the apostles and martyrs; blue or violet, for penitents; and green, in times of hope. Formerly, great men gave liveries to several who were not of their family or servants, in order to engage them in their quarrels for that year.

LIVERYMEN of London, are a number of men chosen from amongst the freemen of each company. Out of this body the common council, sheriff, and other superior officers for the government of the city, are elected; and until the passing of the reform act they alone had the privilege of giving their votes for members of parliament, from which the rest of the citizens were excluded. See LONDON.

LIVIUS, TITUS, the most celebrated of the Roman historians, was descended from an illustrious family which had given several consuls to Rome. Only a few particulars of his life have been transmitted to us. He was born at Patavium, now *Padua*, in the north of Italy, B. C. 59, the year before Cicero was driven into banishment; and died, at the advanced age of ninety-six, A. D. 18, the same year as Ovid. He resided during the greater part of his life at Rome; and, if we may credit a statement of Suetonius (*in Claud.* 41), became the instructor of the Emperor Claudius. His history was written partly at Rome and partly at Naples, and it is said that his reputation was so widely diffused, that a native of Gades, now *Cadiz*, in Spain, actually visited Rome for no other purpose than to have the pleasure of forming an acquaintance with the historian. (Plin. *Ep.* ii. 3.) From some inscriptions found at Padua in 1413, it has been asserted that Livy was twice married, had two sons and four daughters; but this must rest merely on conjecture, as there were no doubt many of the same name in Padua. Seneca (Procem. v. *Controv.*), indeed, states that one of his daughters was married to L. Magius the rhetorician.

Besides his history, we are acquainted with the titles of three other works of which he was the author; but not a fragment of them has been preserved. These were, *Epistola ad Filium scripta*, mentioned by Quintilian (i. 10); *Dialogi*, which Seneca (*Epist.* c.) hesitates whether he ought to class amongst historical or philosophical works; and *Libri ex professo Philosophiam continentes.* The loss, however, of these works, is less a subject of regret than that of the greater part of his *Roman History*, or, as he himself modestly entitles it, *Annals of the Roman people.* This work extends from the building of the city to the year 744 (B. C. 9), when Drusus was carrying on war in Germany, and in which he died. Livy undertook this work probably at the suggestion of Augustus, when he was already far advanced in years. It consisted of 142 books, of which only thirty-five remain; and some of these (lib. xli. xliii. xliv. xlv.) are in a very imperfect state. The first ten contain the history of Rome from its foundation to the year of the city 460, the others (xxi.–xlv.) from 536 to 586, or from the beginning of the second Punic war to the end of the wars with Perseus and Gentius. Of the remaining books we possess only short epitomes, which have been supposed, though without any sufficient reason, to have been composed by the writer Florus. It would appear that a complete copy of Livy's History existed at the beginning of the sixteenth century; but all attempts to discover it have hitherto proved unavailing. Some fragments have indeed been found, and published at Rome, by Niebuhr (1820); but they are few and unimportant. There is, indeed, no loss that has befallen us in Roman literature at all to be compared to that which has left this history imperfect.

Livy follows a chronological arrangement in his history, and, like Dionysius of Halicarnassus, has adopted the Catonian era for his basis. He therefore supposed the city of Rome to have been founded B. C. 751, whereas Varro placed it two years earlier, B. C. 753. The sources from which he derived his information, more particularly for the earlier parts of his history, seem less worthy of belief, though he probably had recourse to the best within his reach. All the more ancient historical records had no doubt disappeared, and he could therefore only be acquainted with their statements through the medium of later annalists. For this early period he had recourse to the works of no Greek historian, unless we include amongst them that of L. Cincius Alimentus, who, though a Roman, wrote in the Greek language. This author served in the second Punic war, and he is called by Livy (vii. 3) a most diligent investigator of ancient monuments. In the early part of the war he fell into the hands of Hannibal, and from him he received an account of his passage through Gaul and across the Alps, which he incorporated in his history. To the works of this writer Livy acknowledges himself much indebted. As to the sources from which he drew his materials for the second decade (xi.–xx.), which is lost, all that can be said is only matter of conjecture; but we know that Polybius was the principal writer whom he consulted, and that he followed that writer generally both in the arrangement of his materials and in the development of the story. It is not a sufficient answer to this that Livy seldom alludes to Polybius as his authority, since he does not think it necessary to cite the writer upon whom he depends for his information, unless on occasions where there is a difference of opinion. There is no doubt, that wherever he has adopted the statements of Polybius, we may place perfect confidence in the account; and yet, where they differ, we must not condemn Livy, who evidently consulted Roman authorities of undoubted credibility, and who may, upon due examination, have come to the conclusion that Polybius was mistaken. The difference in the accounts given by the two historians of Hannibal's passage across the Alps is an example of this, though the balance of probability is greatly in favour of that of Polybius.

Livy has been accused of a wilful perversion of the truth, of an undue partiality for his own country, and a desire to recommend himself to the favour of the nobility, by flattering their pride by the manner in which he records the deeds of their ancestors. But if he represents the characters of his countrymen in a different light from other writers, might he not suppose himself better able to appreciate their conduct? and if his love of country led him to conceal whatever might be prejudicial to them in the eyes of posterity, it was a fault for which he may be forgiven, though it certainly must be allowed to detract considerably from the value of his work. He has been accused also of superstition, because he has reported faithfully all the prodigies and omens in which those early ages abounded, and which seemed to have formed the principal part of their religion; but he has several times observed, that he narrates those wonderful events because he found them in the ancient annalists whom he consulted, without meaning to vouch for their accuracy. Livy was evidently gifted by nature with a brilliant talent for narration, and for seizing the characteristic features of humanity. He was a poet, though without the power or perhaps the love of versifying. His rhetorical powers, too, were of the highest order; and, in the palmy state of the republic, he would have ranked amongst the first orators of his age. The periods of Livy are full and well rounded, in imitation of the style of Cicero; and indeed the age in which he lived would have tolerated no other mode of writing. It is strange that there should be any difficulty in discovering the political sentiments of the historian; but he felt that he was writing under the eye of a despot, however amiable, and he thought himself obliged to suppress many sentiments to which he would in other circumstances have given utterance. He was fully sensible of the degeneracy of his own days, and was glad to forget it by reviving the recollection of all that was glorious and noble in the past. He might also imagine that he could excite in the breasts of his countrymen a desire to emulate the heroic deeds of their ancestors, and might thus be the means of restoring the constitution of his country to its ancient form and strength. It is said that Augustus accused him of being too favourable to the party of Pompey (Tacit. *Ann.* iv. 34); and we may therefore conclude that he was in his heart a partisan of the republic. It has been much disputed what Asinius Pollio (*Quintil.* viii. 1) meant by the accusation he brought against Livy of Patavinity (*Patavinitas*); but it seems the most likely conjecture that it was some provincialism in the language and style, perceptible to the refined ear of a Roman critic, though we can no longer discern it.

Livy's History was first printed at Rome, about the year 1469, by Sweynheym and Pannartz, in folio. Of this rare edition Lord Spencer is in possession of a fine copy; but the most exquisite one is that printed on vellum, which formerly belonged to the Imperial Library at Vienna, but was afterwards acquired by a private collector in England. Amongst the subsequent editions of the history may be mentioned that of Gronovius, "cum notis variorum et suis," Leyden, 1679, in three vols. 8vo; that of Leclerc, Amsterdam, 1709, in ten vols. 12mo; that of Crevier, Paris, 1735, in six vols. 4to; that of Drakenborch, Amsterdam, 1738, in seven vols. 4to, reprinted at Stuttgardt, 1820–1827, in fifteen vols. 8vo; that of Ruddiman, Edinburgh, 1751, in four vols. 12mo; that of Homer, London, 1794, in eight vols. 8vo; that of Oxford, 1800, in six vols. 8vo; and that of Ruperti, Göttingen, 1807, in six vols. 8vo. The edition of the first five books of Livy, by Dr John Hunter of St Andrews, Cupar Fife, 1822, is remarkable for its great accuracy, and is accompanied with English notes, in which are treated some of the most refined principles of philology. (See Lachmann, F. *De Fontibus Historiarum Livii, Comment.* 4to, Götting. 1822–1828. Maierotto, J. H. L. *De Candore Livii,* fol. Berlin, 1796; *De Testimoniorum Livii fide,* 1797; *De Livii Arte Narrandi et Artificio Historico,* 1798.)

LIVIUS ANDRONICUS, a comic poet who flourished at Rome about 240 years before the Christian era. He was the first who turned the personal satires and Fescennine verses, so long the admiration of the Romans, into the form of a proper dialogue and regular play. Though the character of a player, so valued and applauded in Greece, was reckoned vile and despicable amongst the Romans, Andronicus acted a part in his dramatical compositions, and engaged the attention of his audience by repeating what he had worked up after the manner of the Greeks. Andronicus was the freedman of M. Livius Salinator, whose children he educated. His poetry had grown obsolete in the age of Cicero, whose nicety and judgment would not even recommend the reading of it.

LIVONIA, a province or stadtholderate in European Russia. A part of Esthonia is now included in it, viz. Dorpat and the island of Oesel. It extends over 20,636 square miles, between 56. 34. and 59. 3. north latitude, and 23. 29. and 27. 32. east longitude. Though a great part of the province is sandy, and contains much woody, swampy, and heathy land, yet there are many portions of good soil, very productive in corn, hemp, and flax, which form the principal exports from Riga, and the several small ports along the shore of the Baltic. The inhabitants are about 800,000, the greater part of whom are of German origin, amongst whom the ancient tribes, the Letts and the Esthonians, are much mingled, though their original language has nearly disappeared. About two thirds of the population adhere to the Lutheran religion; the rest are Greeks, Catholics, or Jews. The trade is extensive in the export of native products; and in some seasons the quantity of corn grown beyond that consumed causes a brisk trade in grain, as well as in the spirits distilled from it, and pays for the salt, iron, lead, wine, and articles of luxury which the country does not yield.

LIVONICA TERRA, a kind of fine bole used in the shops of Germany and Italy. It is found in Livonia, from which it derives its name. It is in the form of little cakes.

LIVORNO, a town of the province of Vercelli, in Piedmont, containing 3640 inhabitants, who subsist by cultivating rice and breeding silk worms.

LIVRE, a French money of account, containing twenty sols or sous. See MONEY.

LIWNY, a circle of the Russian province of Orel, which extends in north latitude from 52. 49. to 53. 30. and in east longitude from 37. 16. to 38. 20. The capital is a city of the same name, situated on the river Sosna, 720 miles from Petersburg. It contains ten churches, 750 houses, and 6800 inhabitants. It is in latitude 53. 10. N. and longitude 37. 45. E.

LIXIVIOUS, an appellation given to salts obtained from burned vegetables by pouring water on their ashes.

LIXIVIUM, in *Pharmacy*, a ley obtained by pouring some liquor upon the ashes of plants. It is more or less powerful in proportion as it has imbibed the fixed salts contained in the ashes.

LIZARD, in *Geography*, a cape or promontory of Cornwall, situated, according to the most common computation, in long. 5. 47. W. and lat. 49. 50. N.

LJUBIM, a circle of the province of Jaroslaw, in Russia, extending between 57. 49. and 59. 2. north latitude, and 40. 10. and 40. 43. east longitude. It comprehends one city and 620 villages, which are divided into thirty parishes, each having a church. The inhabitants are 57,584. It depends wholly on agriculture and the breeding of cattle. The capital, of the same name, is situated on the river Obnora, 620 miles from St Petersburg. It contains four churches, 531 houses, and 1590 inhabitants. Long. 41. 1. E. Lat. 58. 6. N.

LLANBADARN VAWR, a market-town of Wales, in the county of Cardigan and hundred of Isar, 204 miles from London, and situated on the river Rydal. It is said to have been once a large city, the see of a bishop, and called Mauritania. Near to it, on the road to Aberystwith, are the remains of an extensive pile of buildings, which, according to tradition, was the castle of Owen Glendower. It is a corporate town, with a market, which is held on Tuesday. The population amounted in 1801 to 1228, in 1811 to 1373, in 1821 to 1479, and in 1831 to 1634.

LLANBEBLICK, a large parish of Wales, in the county of Carnarvon and hundred of Irwigfai, 250 miles from London. The town of Carnarvon forms part of this parish, and the population of the whole amounted in 1801 to 3626, in 1811 to 4595, in 1821 to 5788, and in 1831 to 7642.

LLANBEDER, or LLAMPETER, a market-town of Wales, in the county of Cardigan and hundred of Modwyn, 204 miles from London. It is situated on a fertile vale on the river Teife, over which a bridge, built by the king of that name, gives the town the addition of Pont Stephen. It is an ancient borough, having, with Cardigan, Aberystwith, and Aspar, formerly returned a member to parliament, and by the recent law it enjoys the same privilege. There is a market on Tuesday, and five fairs are held in the course of the year. The population amounted in 1801 to 1037, in 1811 to 750, in 1821 to 937, and in 1831 to 1317.

LLANDAFF, a small city, but so classed because it is the see of a bishop. It is in the hundred of Kibbon, of the county of Glamorgan, Wales, 162 miles from London, and is situated on the river Taff. The cathedral is an ancient building, of the architecture of various ages, and of most discordant styles, but containing some admirable monuments. The palace of the bishop may be traced by remains of ancient walls, and the building itself is reported to have been destroyed by the Welsh prince, Owen Glendower. Llandaff, though a city, has no market. It has a small harbour on the north bank of the Severn, two miles from Cardiff. The population amounted in 1801 to 860, in 1811 to 960, in 1821 to 1138, and in 1831 to 1299.

LLANDILLO VAWR, a market-town of South Wales, in the county of Carmarthen and hundred of Perfydd, 202 miles from London, situated on the river Towy, which abounds in fish, especially salmon. It has a well-supplied market on Saturday. The population of the town amounted in 1801 to 647, in 1811 to 776, in 1821 to 1019, and in 1831 to 1268; but the whole parish at the last census contained 5149 inhabitants.

LLANDOVERY, a market-town of South Wales, in the county of Carmarthen and hundred of Derlis. It stands on the river Towy, 188 miles from London. Near to it are the remains of an ancient castle, now covered with ivy. It has a market on Friday, and several fairs. It is not a parish, but forms part of the parish of Landingal. The population amounted in 1801 to 1395, in 1811 to 1442, in 1821 to 1820, and in 1831 to 2242.

LLANELLY, a town which had formerly a market, in South Wales, in the hundred of Carnwallen and county of Carmarthen. It is 220 miles from London. It stands on a creek running out of the Severn, called the Bury, at the mouth of which is an island, on which formerly stood the monastery of Machunis. The chief trade consists in the shipment of coals for Bristol, and the several towns of the north of Somerset and Devon. This commerce has increased the population, which, including the whole parish, amounted in 1801 to 2972, in 1811 to 3891, in 1821 to 5649, and in 1831 to 7646.

LLANGADDOCK, a town of South Wales, in the county of Carmarthen and hundred of Perfydd, 184 miles from London. It stands between the rivers Branc and Swathy. It has some manufactures of woollen stockings and coarse cloth. It contains three hamlets. There is an ancient castle, now in ruins. The market is held on Thursday. The population of the parish amounted in 1801 to 1821, in 1811 to 1964, in 1821 to 2484, and in 1831 to 2476.

LLANGOLLEN, a town of Wales, in the county of Denbigh and hundred of Chirck, 192 miles from London. It is in a most romantic situation on the river Dee, and on the great post road from London to Dublin. The bridge is an object of great curiosity. About two miles from it are the striking remains of Valle Cruces Abbey, and not far from it those of one of Owen Glendower's castles. It has a market, which is held on Saturday. The population of the whole parish amounted in 1801 to 2658, in 1811 to 2897, in 1821 to 3535, and in 1831 to 4498.

LLANOS, SAN JUAN DE LOS, a province in that part of the republic of Colombia which formerly constituted the viceroyalty of New Granada, being bounded on the north by Meridas and Varinas, on the east by Varinas, on the south by Quixos, and on the west by Bogota. Its limits are somewhat vague, the name signifying province of the plains, which extend their dreary surfaces from 200 to 300 leagues in length, and about the same in breadth. It is watered by many large rivers, the principal being the Rio Meta, the Casanare, the Vichada, and the Orinoco. The soil is fertile, and perfectly level: not a hill nor any other inequality is to be seen as far as the eye can reach. But the appearance of the plains is totally changed at different seasons of the year. During the rainy season they are covered with fine grass, on which numerous herds of cattle graze; and in the time of extreme drought, vegetation being destroyed by the excessive heat of the sun, they appear but a sandy desert. Upon the banks of the rivers, however, vegetation is at all times so profuse and often so thick as to be almost impenetrable. The climate is immoderately hot, and very unhealthy. In some parts the air is pure, and in others vaporous, and full of fine dust raised from the dried mud of the rivers.

The northern portion of this province has been recently separated into a distinct district called Casanare, which name is now often applied to the whole. In this territory, cacao, maize, yucas, plantains, &c. are produced; and the lakes and rivers furnish abundance of fish for the support of the inhabitants. Its principal town is Pore, situated in an unhealthy climate, about 133 miles north-east of Bogota, and containing 500 inhabitants. On the banks of the rivers there are many missionary and other villages, instituted for the conversion of the scattered tribes of Indians who roam through the country between the Orinoco and the Andes. These tribes are termed *Llaneros*, or inhabitants of the plains, whose chief employment consists in attending to the herds of cattle which feed on the pastures. The principal commodity of the plains is the peltry of animals manufactured by the inhabitants. The population, including Casanare, is about 20,000.

Llanos, *San Juan de los*, the capital of the above province, is situated in longitude 73. 55. 30. west, and latitude 3. 11. north, about fifty miles east-south-east of Bogota. It was founded in 1555, and was celebrated for the gold found in its neighbourhood, but now contains very few inhabitants, who live in great poverty.

LLAN-RHAIDAR-YN-MOCHNANT, a large parish of Wales, in the county of Denbigh and hundred of Chirck. It is situated in a deep hollow, and surrounded on every side by lofty mountains. It is much frequented by visitors, who go to it to get a view of the celebrated water-fall of Pistell-Raiadr. It is 224 miles from London. The population amounted in 1801 to 1869, in 1811 to 1974, in 1821 to 2229, and in 1831 to 2344.

LLANTRISSANT, a borough and market town of South Wales, in the county of Glamorgan and hundred of Miskin, 170 miles from London. In the neighbourhood are valuable lead mines. It has a market, which is held on Friday. In conjunction with Cardiff and Cowbridge, it will in future elect one member to parliament. The population amounted in 1801 to 1715, in 1811 to 2122, in 1821 to 2585, and in 1831 to 2789.

LLANVILLING, a borough and market town of North Wales, in the hundred of Llanfyling and county of Montgomery, 186 miles from London. It is well built, and was incorporated by Edward I. There is a good market on Tuesday. This town, in conjunction with Llanydloes, Welch-Pool, Machynlleth, and Newton, returns, under the new law, one member to the House of Commons. The population amounted in 1801 to 1394, in 1811 to 1508, in 1821 to 1706, and in 1831 to 1836.

LLANYDLOES, a market-town of North Wales, in the county of Montgomery and hundred of its own name, 190 miles from London. It is pleasantly situated on the right bank of the Severn. Plinlimmon, the highest mountain in Wales, is distant from it about seven miles. It joins with Welch-Pool, Machynlleth, Llanvilling, and Newton, in electing one member to the House of Commons. The population amounted in 1801 to 2282, in 1811 to 2386, in 1821 to 3145, and in 1831 to 4189.

LLOYD, William, a learned English writer and bishop, was born in Berkshire, in England, in 1627. He was educated under his father, rector of Sonning, and vicar of Tyle-hurst in Berkshire. He then went to Oxford, and finally took orders. In 1660 he was made prebendary of Rippon, and in 1666 chaplain to the king. In 1667 he took the degree of doctor of divinity; in 1672 he was installed as dean of Bangor; and in 1680 he was consecrated bishop of St Asaph. He was one of the six bishops who, with Archbishop Sancroft, were committed prisoners to the Tower of London, for subscribing a petition to the king against distributing and publishing his declaration for liberty of conscience. Soon after the Revolution he was made almoner to King William and Queen Mary. In 1692 he was translated to the bishopric of Litchfield and Coventry, and in 1699 to the see of Worcester, where he remained till his death, which happened in 1717, in the ninety-first year of his age. Dr Burnet gives him an exalted character, and his works are highly esteemed.

LOAD, or Lode, in *Mining*, a word used especially in the tin mines, and signifying any regular vein or course, whether metallic or not; but load most commonly means a metallic vein. When the substances forming these loads are reducible to metal, the loads are by the English miners said to be alive; otherwise they are termed dead loads.

Load is also used for nine dishes of ore, each dish being about half a hundredweight.

LOADSTONE. See Magnet.

LOAMS are defined to be earths composed of dissimilar particles, stiff, dense, hard, and rough to the touch; not easily broken whilst moist, readily diffusible in water, and composed of sand and a tough viscid clay. Of these loams some are whitish, and others brown and yellow.

LOAN, any thing given to another, on condition of return or payment.

Public Loans. See Funding System.

LOANDO, St Paul de, a city on the coast of Angola, capital of the Portuguese settlements in Western Africa. It is built partly upon a hill, which commands the surrounding country, and partly on the sea-shore, and covers a large extent of ground. It has no walls, but possesses a good fort, garrisoned by malefactors. The streets are wide and regular. The houses of the whites are built of stone, and those of the natives of mud and straw. The port is safe and spacious, and is defended from storms by an island lying in front. The city is the seat of a bishop, and possesses numerous churches and convents. The surrounding country is pleasant and fertile, abounding in cattle, corn, and fruits; but water is very scarce, and must be brought some distance. The climate during summer is warm, but regular sea-breezes moderate the heat considerably. The population is estimated at 3000 whites and free people of colour, without determining the number of slaves, one proprietor often having more than 100 in his service. Long. 13. 22. E. Lat. 8. 55. S.

Loando is also the name of an island situated opposite the city, and about twenty miles long and one broad. It is separated from the main coast only by a narrow channel. It produces no grain, but yields good pasture for sheep and goats, and there are some fisheries upon its coast. The wealthier inhabitants of the city have a number of country houses and gardens here for the purposes of recreation; and it also contains several small villages. It yields, by digging to a small depth, the best water in this part of the country, from which the city is principally supplied.

LOANGO, a considerable country in that part of the coast of Africa known by the name of Lower or Southern Guinea. Its limits are not accurately known. The country tributary to the king of Loango, however, extends from Cape Lopez to the river Congo, a distance of upwards of 400 miles; but Loango proper occupies only the middle part, being bounded by the town of Malemba on the south, and that of Mayomba on the north. The coast in some parts is high, of a red-coloured soil, and the hills are covered with a luxuriant vegetation; but generally it is composed of a very fine sand carried about by the slightest breeze. Towards the interior the soil is fertile, but little improved by an indolent people. The principal grains cultivated are, the manioc, which is used instead of bread, the maize, a species of pulse, and the potato, which grows to a much larger size and is of a stronger flavour here than in Europe. The palm and several other fruit-trees grow wild in abundance, and a great part of the country is covered with thick grass, which often attains the height of eight or ten feet. Wild animals are found, but generally of the smaller tribes; the Chinese hog, sheep, and goat, are used for domestic purposes. The climate is in general good. The year is divided into the dry and the rainy seasons, both of nearly equal duration. During the dry season, from April to October, the climate is exceedingly warm, and so entirely free from hurricanes or high winds, that vessels may anchor on any part of the coast with perfect safety. The temperature, however, is cooled by regular light breezes from the south and south-east. Rain occurs very seldom, and is never violent; but heavy dews fall during the night, which are sufficient for the support of vegetable life. In the rainy season the heat of the sun is greater than in the dry, and would be insupportable but for the great rains which fall and refresh the atmosphere. Iron and copper are found in the country, but the natives are not aware of the method of extracting them from the soil. Salt abounds in shallows along the coast, and is also obtained in the interior by boiling and allowing the water to evaporate. Trades and manufactures are entirely neglected, or only exercised as far as is absolutely necessary for the purposes of life. The inhabitants live in a state of great ignorance and superstition, and although several missions have been sent to the country, little or no good has come of them. The males are very indolent; their chief occupation is hunting or fishing; agricultural affairs they deem degrading, and leave to the females to perform. Their houses are built of straw and junk, and roofed with palm leaves bound together with small branches, which forms a covering impenetrable to rain. They are congregated in villages, and surrounded with palm and cocoa-nut trees, which are carefully kept from injury. The government is despotic, and the dignity is transmitted only in the female line. The princess has the right of choosing her husband, who is compelled to accept the honour, and is debarred the privilege of polygamy, enjoyed in an unlimited manner by his subjects. The king is elected by a council of seven, and it is necessary that the choice should fall on a prince of the blood. His authority is constitutionally absolute, but he is obliged to be circumspect in the use of it in the case of chiefs or tributary princes, who are often equal in power with himself. He is assisted in the executive government by several ministers of state, and great part of the judicial authority is exercised by an assembly in the different villages and towns. He is restricted from using any article not the produce of the country. The slave-trade was formerly carried on to a great extent in this country, but is now much diminished. The port of Loango was almost the exclusive theatre of this trade, but other towns on the coast are now equally frequented. From this practice the population is greatly diminished, and now scarcely exceeds 600,000.

LOANGO, a city, capital of the above kingdom, situated about a league from the sea, in a large and fertile plain. It is about four miles in circuit; but this extent is owing principally to the houses being built in squares, with large spaces between. The streets are long, straight, and kept very clean. The harbour is not deep enough to admit vessels of large tonnage, and its entrance is obstructed by a range of rocks stretching half way across. The coast around the city is recognised by red cliffs, which appear very brilliant when illuminated by the morning rays of the sun. There is some trade here in fine stuffs, manufactured by the inhabitants from leaves. The population is about 15,000. Long. 12. 13. E. Lat. 4. 40. N.

LOBBY, in *Architecture*, is a small hall or waiting-room. It is also an entrance into a principal apartment, where there is a considerable space between that and a portico or vestibule, and the length or dimensions do not allow it to be considered as a vestibule or an anti-room.

LOBE, in *Anatomy*, any fleshy protuberant parts, as the lobes of the lungs, the lobes of the ears, &c.

LOBESTEIN, a city, the capital of the principality of that name, in the dominions of the prince of Reus, of the younger branch. The principality extends over about 100 square miles, and contains 7500 inhabitants. The city is on an elevated stony spot, 1400 feet above the level of the sea, at the foot of which runs the river Lemnitz. It is surrounded with walls, and contains a residence of the prince, 417 houses, with 2960 inhabitants, who carry on some manufactures of linens and woollens. Long. 11. 42. E. Lat. 50. 26. N.

LOBO, JEROME, a Jesuit missionary, was born at Lisbon in the year 1593. He became a member of the society of Jesus at the age of sixteen, and in 1622 went out as a missionary to the East Indies. After making some stay at Goa, he sailed to the coast of Mozambique; and subsequently penetrated into Abyssinia, where his zeal and resolution drew upon him the hatred of the monks, in consequence of which he incurred much danger and suffering. On his return to Portugal he was shipwrecked on the coast of Natal, where seven months were spent in constructing shallops to bring away the survivors. One of these foundered, but that in which Father Lobo sailed arrived safe at Angola. After a variety of adventures he arrived at Lisbon; and he employed himself in the cause of the Ethiopian mission both at Madrid and Rome. He made a second voyage to the Indies, where he was appointed rector of the house at Goa. But he returned to Lisbon in 1658, and was chosen rector of the college of Coimbra, where he died in 1678, at the age of eighty-four. Lobo wrote an historical account of Abyssinia in the Portuguese language, which contains information both curious and valuable. It was translated into French by the Abbé Legrand, in 1728, in 4to; and the earliest production of Dr Samuel Johnson was an abridged version of this work into English.

LOCARNO, a market-town of the canton of Ticino, in Switzerland, alternately with Bellenz and Lugano, the capital thereof, as well as of the circle of its own name. It stands on the river Maggia, which, about one mile from it, falls into Lake Maggiore, or, as it was sometimes called, Lake Locarno. It is a romantic spot, and contains 340 houses, with 1600 inhabitants. Bell-founding is one of the trades carried on at it. Long. 8. 35. E. Lat. 45. 39. N.

LOCCUM, a town of the province of Calenbourg, in the kingdom of Hanover. It contains 152 houses, and 1120 inhabitants. It is remarkable for its abbey, which is possessed by a Protestant superintendent, and is the richest preferment of the church of Hanover, as the abbot of Loccum is the chief magistrate of the district, and has a seat in the upper legislative house of the states.

LOCHABER, a district of Inverness-shire, in Scotland. It is bounded by Moidart on the west, Glengary on the north, Badenoch on the east, and Lorn on the south. It derives its name from the lake or loch of Aber; and extends about twenty miles from east to west, and thirty from north to south. The country is barren, bleak, mountainous, and rugged. See INVERNESS-SHIRE.

LOCHES, an arrondissement of the department of the Indre and Loire, in France. It extends over 768 square miles, is divided into six cantons and seventy-six communes, and contains 58,500 inhabitants. The chief place is the city of the same name, in a fine situation on the left bank of the Indre, over which is a fine bridge. It is surrounded with vineyards, and is overlooked by an ancient castle, in the church of which is a monument in memory of the celebrated Agnes Sorel. It contains 640 houses, and 4800 inhabitants, who make some thin woollen goods. Long. 0. 54. E. Lat. 47. 7. N.

LOCK. This very useful article needs little description; but an explanation of the principles on which its security depends will probably be new and interesting.

The most essential portion of a lock is a bolt which can be thrown out or withdrawn only by its proper key; and the best lock is that which most perfectly prevents any other instrument from effecting this purpose.

There are two distinct modes by which this excellence has been sought; and a clear understanding of their principles and differences will greatly promote a due appreciation of the many ingenious contrivances to which the pursuit of this object has given rise.

The first mode consists in the insertion of fixed obstacles, called *wards*, to the entrance of other instruments than the proper key. They are placed between the keyhole and the bolt; and in good locks they are made numerous and intricate, for the double purpose of preventing access to the bolt, and of varying the patterns of the keys.

The second mode consists in the insertion of obstacles to the motion of the bolt; not fixed, therefore, like the *wards*, but moveable, by means of the proper key, into positions which give freedom to the bolt. They are frequently called *tumblers;* and we shall here apply that very expressive term to all moveable impediments to the retraction of the bolt, retaining the equally appropriate designation of *wards* to describe the fixed impediments to the introduction of surreptitious instruments.

These two means of protection, namely, wards and tumblers, may be applied separately or combined.

Till the middle of the last century, the locks used in Europe depended principally on the number and intricacy of their wards. But very little skill was exhibited even in this respect, though a great deal of misplaced labour and ingenuity was sometimes expended in fanciful decorations.

One very serious objection to the use of wards alone is, that they do not require to have exact counterparts in the key. It is true that the proper key is usually cut in perfect correspondence with the wards in the lock, but such accuracy is not indispensable, as the diagram figures 1 and 2 in Plate CCCXXIV. will render evident.

Let figure 1 represent the *bit* or *wet* of a key curiously cut. The essential parts of such a key are the pipe *a*, which fits on to the pin of the lock, and the extremity *bc*, which acts against the bolt. The intermediate portions are required merely to connect these two; the greater portion of the metal is therefore superfluous, and might clearly be removed, as shown in figure 2, which retains all that is wanted for connection and strength. But this facility of fabrication from an impression of the key is not the only evil. There is the chance that out of many variously formed skeletons, one will be found to pass almost any lock guarded by wards alone; to which may be added, the fact that an impression of almost any fixed wards may be obtained by introducing into the lock a blank key of proper size, having its bit covered with wax or tallow.

Whilst we are on the subject of keys, it may be noticed that some, instead of the small piercings, such as are shown in figures 1 and 3, have considerable portions of the bit cut away, more nearly resembling figure 2. In the former cases the wards are formed of thin iron plate; in the latter, of solid brass, and hence such locks are called solid warded. This peculiarity, however, adds nothing to the difficulty of picking, or of making false keys. The best sort of wards are those which intertwine from opposite sides of the bit, as in figure 3, which, it is obvious, would require to be more nearly imitated than the more numerous cuttings of figure 1. The bits of keys, as viewed end-ways, are variously shaped; the ordinary form is figure 4; figure 5 is called a taper bit, and figure 6 an S-shaped bit. No effect besides variety of pattern is obtained from these devices.

In reference to the operation called picking, the number and variety of the wards afford no security whatever. There must always be a clear passage in the lock for the revolution of the portion *bc* of the key, and through this passage the pick-lock introduces his *pick*, which is made semicircular for the purpose of passing round the exterior circle of the wards.

Locks destitute of tumblers may be generally recognized by a smart snapping noise in the act of locking, which arises from the pressure of a spring formed in the back of the bolt, and from which they are called back-spring locks. Figure 7 shows one of these locks, in which *a*, *a* are two notches on the underside of the bolt, connected by a curved part; *b* is the back-spring, which is here compressed by the passage of the curve through a limited aperture in the rim *cc* of the lock. The bolt is in the state called half-shot; when it is wholly shot, or wholly withdrawn, the notches *a*, *a* rest upon the rim *cc*, and the force with which they fall into this position, urged by the spring *b*, gives rise to the noise before mentioned. The back-spring lock is further objectionable from the facility with which the bolt may be forced back by any pressure applied to its end; an application which, on wooden doors and furniture, it is frequently possible to make.

The first improvement on the lock guarded by wards consisted in the addition of a single tumbler, as seen in figure 8. The bolt is here also supposed to be half shot, and it has two notches on its upper edge, which receive the stud *a* of the tumbler respectively, when the bolt is at one or other end of its course. The tumbler turns on a pin at its other extremity; it is forced downwards by a spring, and it is wide enough, lying behind the bolt, as shown by the dotted lines, to be elevated by the bit of the key.

This construction, in addition to a more or less perfect box of wards, forms what is called the common-tumbler lock, and which, though better than the back-spring lock, is easily picked, for this reason, that the tumbler merely requires to be lifted sufficiently high; if it be raised more than is necessary, the bolt is equally set free. An expert smith therefore finds little difficulty in throwing out the tumbler, and at the same time moving the bolt.

In this state the art of lock-making remained, when, in the year 1778, Mr Barron obtained his patent for what may be called the first scientific attempt to improve this very important instrument. Mr Barron increased the number of tumblers to two or more, and he so applied them, that mere elevation was no longer sufficient to release the bolt; they required a precise degree of elevation, neither more nor less, and each tumbler a peculiar quantity. Figure 9 will explain this ingenious and effectual change; the tumblers are shown by dotted lines behind the bolt, which latter has in its middle a groove or slit, notched on both edges, through which are seen projecting the studs of the tumblers. The bolt, as in the former cases, is supposed to be half shot; but it will be easily perceived, that if the studs of the tumblers rested in the lower notches, they would require to be elevated to the level of the groove before the bolt could be moved; and it is equally clear, that if lifted too high, they would be engaged in the upper notches, and would equally detain the bolt. The tumblers were made unequally wide, and demanded therefore similar inequalities in the bit of the key, which was stepped or notched, as shown in figure 3. The relative positions of the bolt and tumblers are seen in the section of the lock, figure 10. It must, however, be understood, that this and the former figures are not portraits of locks, but rather diagrams, to explain the theory of their action.

Barron's lock, when well made, with two or three tumblers, and a good box of wards, is extremely difficult, if not impossible, to pick; for the wards, which are useless as preventives to the operation of throwing up a single tumbler, greatly impede so delicate a proceeding as the elevation of two or more to a precise height; and this required delicacy of manipulation has formed the basis of all the subsequent attempts at improvement.

The first of these in time and ingenuity is that of Mr Bramah, who procured his patent in 1784, but afterwards very materially modified his invention. Mr Bramah's lock, though presenting little that is novel in principle, is singularly ingenious and compact in its arrangement; and it has the advantage of being chiefly formed in the lathe, by which means the most perfect accuracy of form is made compatible with very moderate cost.

Mr Bramah rejected entirely the use of fixed wards, employing only moveable guards, which we shall call tumblers, because they are analogous to the parts so named in Barron's and other locks. Of these he introduced never less than four, and frequently six or eight. Having no wards, he required no large bit on which to cut their counterparts; and thus he effected the double purpose of giving great portability to the key, and of so reducing the size of the key-hole as in some measure to compensate for the absence of wards as checks to any fraudulent attempts upon the tumblers.

The general features of this lock will be best understood from an examination of figures 11 to 16. It may be described as consisting of two brass barrels, the outer one, *aaaa*, being screwed to the plate or body of the lock, which is, however, not shown, and the inner one, *ccccc*, revolving within it. The inner barrel is shown detached in figures 14 and 15: it has a pin or stud *b*, which moves the bolt in the act of locking or unlocking, performing therefore the office of the bit of the ordinary key. The security of this lock depends, then, on certain contrivances, which prevent the revolution of this inner barrel, except on the application of its proper key. For this purpose, it has an external circular groove penetrating to the depth shown by the dotted circle in its section, figure 15; and it has four internal longitudinal grooves, as seen also in figure 15, but here seen occupied by what are in fact double pieces of steel-spring, formed like figure 16. These pieces of steel are the moveable guards or tumblers; and they prevent, except under certain circumstances, the revolution of the inner barrel. To do this, a thin plate of steel, called the locking-plate, *d d*, figures 11, 12, and 13, is screwed in two portions to the outer barrel, and at the same time occupies the external circular groove of the inner barrel, having four notches to receive the edges of the tumblers, figure 16, which lie in the internal longitudinal grooves. It will be seen now that the inner barrel is locked to the outer, because the tumblers of the inner barrel are detained in the notches of the locking-plate *d d*, which is screwed to the outer barrel. If, however, the tumblers be also notched as much as the locking-plate projects into their grooves, and if these notches be brought into the plane of the locking-plate, it is obvious that the barrel would then revolve, and the notches so formed would traverse the projection of the locking-plate into the longitudinal grooves. Such a notch is therefore formed in each tumbler; they are represented by the deepest of the three notches shown in the several figures, and are at various distances from the end of the tumbler. The smaller notches need not be alluded to at present. The tumblers have a projection at one end, by which they are pressed upwards by means of the spiral spring shown in figures 11 and 12. In the former figure, the tumblers occupy their usual position in the lock; in the latter they are unequally depressed by the unequal slits in the pipe of the key, so that their deep notches are now in the plane of the locking-plate, and the inner barrel is free to revolve. As the tumblers are unequally depressed, it is clear that only one of them (the lowest) can be supported by the spiral spring; the other three would therefore be left unsupported, but that they have sufficient friction in their grooves to retain them where they are placed, for the purposes of locking and unlocking. This friction is given by bending outwards the spring-plate of which they are made, as in figure 16; but it is not sufficient to prevent the spiral spring from elevating them all to the same level as soon as the key is withdrawn.

Such was Bramah's lock, as it first came extensively into use, and as it continued for many years, employed for the most important purposes, and by the most distinguished persons. At length an advertisement appeared in the public papers, requesting those who had lost keys of Bramah's locks, not, as had hitherto been done, to break open their doors or drawers, but to apply to the advertiser, who would undertake to save this destructive process by picking. And it appeared that an individual of great dexterity could perform this operation almost with certainty.

The effect of this discovery on the demand for the locks may easily be imagined; but the effect it had in stimulating ingenuity to provide a remedy, is one of the best illustrations of the proverb, that necessity is the mother of invention. Within a few days or weeks, Mr Russell, who was at that time employed in Mr Bramah's establishment, devised an alteration which at once, and without any expense, entirely overcame the difficulty, and converted the lock into one of perfect security. This contrivance is the most simple and extraordinary that ever effected so important an object; but before we describe it, we will endeavour to explain what has been called the *tentative* process of lock-picking, and which had been so successfully applied to Bramah's locks. To do this, we will refer to the diagram, figure 17, in which *a* represents a bolt fitting loosely an outer case, and tending to move in the direction of the arrow. It is, however, prevented by three studs, which are moveable upwards and downwards by their knobs, 1, 2, and 3; but it would be free to move if these studs were elevated or depressed to correspond with the notches made in the end of the bolt. Now, if the case were closed, it would be perfectly easy to place these studs in the requisite position by the following process: Apply a pressure to the bolt, which can be done in any lock, tending to move it for unlocking. This will of course be resisted by the studs 1, 2, 3, but not by all equally; it will in fact be resisted by only one of them; the necessary imperfections of all workmanship would prevent more than one at a time from coming into sensible contact with the bolt. Having therefore applied pressure to the bolt with one hand, with the other the operator would ascertain which of the studs was most bound by the pressure. This would be easily done, and then he would move the stud gently up and down till he felt it catch in the notch to which it belonged. The bolt would move till the next most prominent stud received it, which would be tracked to its notch in the same manner, and so on till all were disposed of.

By a similar process the picking of Bramah's lock was effected. A tendency to revolve was given with some force to the barrel; then, by means of a pair of small forceps, the several tumblers were tried, and it was ascertained which was most detained by the pressure against the locking-plate. That which offered most resistance was gradually depressed till its notch was felt to hang itself upon the locking-plate, and so on till the whole were depressed in succession, exactly as they would have been depressed simultaneously by the key.

Returning to figure 17, it will be easily understood, that if, in addition to the three principal notches, a number of shallower notches, as indicated by dots, be made, equal however in depth to any possible inequality in the projection of the studs, the process we have described is entirely prevented, because it will be perfectly impossible for the picker to tell whether he has brought the stud to one of the deep notches, or to one of the shallow or false notches; and he will of consequence be entirely baffled.

This was the happy suggestion to which we have alluded. This will explain the two shallow or false notches which now appear in the edges of Bramah's tumblers, and which require corresponding false notches, or rather false widening in the notches, of the locking-plate, as shown by the dots in figure 13.

From this time the art of lock-making presents nothing very decidedly new, though almost every year produces something which claims the public attention for a time, and is forgotten. From this description must, however, be excepted the lock of Mr Chubb, which has come into extensive use. It consists of Barron's tumblers, more or less numerous in proportion to the price, with few or no fixed wards, and without the false notches, or any similar contrivance. But it has an ingenious piece of mechanism called a *detector*, consisting of a lever, which, if any undue elevation be given to the tumblers, catches into and detains the bolt, till, by a peculiar application of the proper key, it is again released. Whether this detector be a more or less perfect guard than the others we have described, and whether it be or be not an advantage to learn that a false key has accidentally or designedly been introduced into a lock, are questions which remain open to discussion. Certain, however, it is, that by thus varying the construction of locks, we obtain the benefit of greater variety in the keys, which would otherwise be so multiplied of similar makes, as to neutralize in a great measure the benefits of the skill which has been applied to the locks. On this point it may be mentioned, that Bramah's keys, as made by himself and by Mordan, are constructed by a beautiful tool, which secures a constant change in the pattern, so that duplicates are not likely to recur for a long series of years.

Of the locks called "Combination Locks," it will not be required to say much. The common letter padlock is generally known; and, from the description here given of other locks, it will be easily understood that the lettered rings of the padlock are in fact tumblers, exposed to the operation of the hands, instead of being subjected to the concealed application of a key. These locks are not difficult to pick, though they might be made quite secure by the use of the false notches. There is indeed no tumbler lock to which this most invaluable idea might not be advantageously applied.

We have reserved till now the notice of a very curious lock, which is said to have been used for four thousand years in Egypt and Turkey, and which was first made well known to Western Europe through the French invasion of Egypt at the beginning of the present century, though it had been previously described by Eton in his Survey of the Turkish Empire. It appears to be extensively, or rather universally, employed for gates of towns and of houses, as well as for the smallest articles of furniture. The evidence of its alleged antiquity is derived, according to M. Denon (in whose magnificent work on Egypt it was published), from the circumstance of finding one sculptured amongst the bas-reliefs which decorate the great temple at Karnak, from which also it was ascertained that during forty centuries the lock had undergone no sensible change.

However this may be, its construction is singular and interesting, and particularly so because it makes exclusive use of *tumblers*, which, it will have been seen, were the last means of security adopted in this country. It will be understood by an examination of figures 18 to 21. In figures 18 and 19, *aa* is the case screwed to the door, and *bb* is the bolt. In the case, above the bolt, are a number of small cells containing headed pins, arranged in any form chosen by the maker. The top of the bolt has a number of holes similarly arranged, so that when brought into the right position, the ends of the headed pins may drop into the corresponding holes in the bolt. In this state the bolt is fastened. In order to unlock it, a large hollow or cavity is made at the exposed end of the bolt, which extends under the holes occupied by the pins. The key consists of a piece of wood, figs. 20 and 21, having pins arranged like those in the lock, and as long as the thickness of the bolt above the cavity. When therefore the key is introduced and pressed upwards, its pins exactly fill the holes in the bolt, and of course dislodge those which had fallen from the upper part of the case. The bolt may in consequence be withdrawn, as in fig. 19, leaving the headed pins elevated in their cells, instead of occupying the position shown by the dotted lines in fig. 18. It should be observed, that in fig. 19 the key is shown in its place, diminishing therefore the apparent size of the cavity in the bolt, which of course must be high enough to receive the key and its pins before the latter are lifted into the holes.

The attention excited by this lock when it was first made generally known caused its merits to be greatly overrated. M. Denon described it as no less secure than any other lock, and fit to be applied on all rural occasions. There would, however, be little difficulty in picking it, or in obtaining a wax impression of the holes; and there is an obvious awkwardness in the mode of using the key as compared with those revolving round fixed centres, which quite disqualifies it for superseding the modern lock. In other respects, it admits of considerable variety in the number, arrangement, and length of the pins; and by grooves in the top of the bolt they might be varied in the same lock. By a slight modification, also, it might have the benefit of Barron's invention, and require a precise degree of elevation. In fact, it has this principle to some extent; for if the pins be raised too much, whatever raises them will hold the bolt by entering into the upper cells.

Numberless contrivances for the improvement of locks, and some of great merit and ingenuity, will be found in the Repertory of Patent and other Inventions, in the Transactions of the Society of Arts, and in other scientific journals. Many of these will be found more curious than useful; such, for instance, as the locks which ring bells or discharge fire-arms when an attempt is improperly made to open them. Such, also, are the propositions to enlist magnetism into the service of lock-making, by employing polarized tumblers, and magnetic keys to act upon them, through the agency of magnetic attractions and repulsions, instead of the vulgar modes of pulling and pushing; and such are the locks made to open only by a peculiar sleight of hand, as if it were possible to preserve such tricks from the knowledge of those who are interested in acquiring them. A more useful class of inventions are the shifting or combination keys, whose parts may be kept by the owner in such a state of derangement as to require the knowledge of a certain cipher or motto in order to use them.

The theory of what have been called master keys, which figure more perhaps in romances than in the real world, will be understood by considering figures 1 and 2 of the engraving. It is clear that a great variety of locks might be made, with keys somewhat resembling figure 1; differing, however, sufficiently to be opened only by their respective keys, yet all of them adapted to the skeleton, or, in this case, the *master key*, figure 2. In this respect, the greatest facilities are presented by Bramah's arrangement. Any number of these locks, of the same size, and having the same quantity of tumblers, may be made to open by one key, though each be proof against any other of the series. For this purpose, nothing is required, but, after the completion of the locks, to cut in each an additional set of notches adapted to the intended master key, leaving the other notches to open it by the application of its peculiar key.

Lock ‖ Locke.

Locke.

Lock, or *Weir*, in inland navigations, the general name for all those works of wood or stone made to confine and raise the water of a river. The banks also which are made to divert the course of a river are called by these names in some places. But the term *lock* is more particularly appropriated to express a kind of canal enclosed between two gates; the upper called by workmen the sluice-gate, and the lower called the flood-gate. These serve in artificial navigations to confine the water, and render the passage of boats easy in passing up and down the stream. See Navigation, Inland.

LOCKE, John, one of the greatest philosophers that England has produced, was born at Wrington, Somersetshire, on the 29th of August 1632, ten years before Sir Isaac Newton. His father was a man of moderate estate, who had suffered by the civil wars, in which he served as a captain on the parliamentary side. After receiving his school education at Westminster, he was sent to Oxford in 1651, and soon became distinguished amongst his fellow-students of Christ Church for his learning, as well as his natural abilities. The philosophy of the schools then held entire dominion at Oxford; and, in after life, Mr Locke was heard to regret having consumed the most valuable time for study at that university, where, in those days, he could learn so little of what was really useful. But it is probable that much more has been made of these expressions than they deserve; for he must have derived considerable benefit from the leisure there afforded for cultivating privately other branches of learning, when he had perceived the futility of the scholastic system; and he undoubtedly enjoyed at that place advantages which led him thus early to form the idea of his great work. That he held self-education to be by far the most important of any, and had experienced this in his own case, there can be no doubt whatever.[1] The first productions that gave him a relish for the study of philosophy, were, it seems, the writings of Descartes, which, from their perspicuity and originality, no less than the boldness with which received opinions were impugned in them, naturally found favour with Locke, although he did not, in many cases, approve of the doctrines which they taught.

After having taken his degrees in arts, Mr Locke applied for some time to the study of physic, not so much, it is said, with a view to practice, as for the benefit of his own constitution, which was originally feeble, and required the observance on his part of a strict regimen. But he must have cultivated medical science to a far greater extent than this would seem to imply, because many of the learned in the faculty entertained a high opinion of his medical knowledge; and, in particular, Dr Sydenham, in his treatise on acute diseases, speaks of his great genius and sound judgment, in terms of very strong commendation. "You know," says he, "how much my method has been approved of by a person who has examined it to the bottom, and who is our common friend. I mean Mr John Locke, who, if we consider his penetrating genius and exact judgment, or the purity of his morals, has scarcely any superior and few equals now living."[2] Hence he was often saluted by his acquaintance with the title, though he never took the degree, of doctor, which he would probably have done had he intended to prosecute physic as a profession, or had he not been diverted from it by other studies and avocations.

In 1660, when the restoration had given rise to great controversies respecting the settlement of the church establishments, Locke appears to have written a tract on the subject, with the intention of printing it; but, from whatever cause, he abandoned his design. It has, however, been preserved, and is the earliest of his works extant. Lord King, in his Life of Locke, has given a few extracts from it, which are extremely interesting, inasmuch as they show how great a leaning he then had towards the side of authority, and how much he was disposed to recommend concessions, upon matters not absolutely essential, for the sake of avoiding civil anarchy and religious discord. The excesses of those who had been the real friends of liberty, but who chose to represent themselves as its only friends, appear to have alarmed him so much as to lead him to think somewhat too favourably of their antagonists. "Since I find," says he, "that a general freedom is but a general bondage; that the popular assertors of public liberty are the greatest engrossers of it too, and not unfitly called its keepers; I know not whether experience would not give us some reason to think, that were the part of freedom contended for and indulged in England, it would prove only a liberty for contention, censure, and persecution." He then states that liberty, in his view of it, is "not a liberty for ambitious men to pull down well-framed constitutions, that out of the ruins they may build themselves fortunes, nor a liberty to be Christians, so as not to be subjects; but that all he can wish for his country or himself is, to enjoy the protection of those laws which the prudence and providence of our ancestors established, and the happy return of his majesty has restored." Such are often the early impressions of those whom reflection and experience afterwards conduct to sounder conclusions. Nothing, in truth, can be more natural, than to feel disgust at the extravagance, intolerance, and injustice of the men with whom we are agreed upon points of essential importance. When we find them ready to persecute us the moment they detect the least difference in our sentiments, it is almost unavoidable to stigmatise them as "the engrossers and keepers of liberty." But the worst effect of such pretensions to infallibility, and of the excesses to which it leads, is, that it sometimes tempts honest and conscientious men to fall into the error of Locke, and to betray a disinclination towards the cause itself, because its most forward professors demean themselves in an overbearing manner. This feeling, be it observed, makes Locke here speak the language of the friends of the Restoration, and overlook those more lasting evils which have almost always attended the return of exiled sovereigns. A short time only elapsed, indeed, before he was made fully sensible of his oversight. The high-church party, finding themselves strong in the new parliament, abandoned all notion of comprehension; and, more intolerant than the Presbyterians themselves, they sought to make differences in all matters, however trivial, operate an absolute exclusion. This change prevented the publication of the tract above mentioned, by rendering its object unavailing.

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[1] The following passages from two letters to Lord Peterborough set this in a strong light. In answer to a letter from his lordship, who had applied to him to recommend a tutor to his son, he says, "I must beg leave to own that I differ a little from your lordship in what you propose; your lordship would have a thorough scholar, and I think it not much matter whether he be any great scholar or no: if he but understand Latin well, and have a general scheme of the sciences, I think that enough; but I would have him well bred, well tempered; a man that, having been conversant with the world and amongst men, would have great application in observing the humour and genius of my lord your son, and omit nothing that might help to form his mind, and dispose him to virtue, knowledge, and industry. This I look upon as the great business of a tutor; this is putting life into his pupil, which, when he has got, masters of all kinds are easily to be had; for when a young gentleman has got a relish of knowledge, the love and credit of doing well spurs him on; he will, with or without teachers, make great advances in whatever he has a mind to. Mr Newton learned his mathematics only by himself; and another friend of mine Greek, wherein he is well skilled, without a master; though both these studies seem more to require the help of a tutor than almost any other." And, in a letter to the same person on the same subject, he says, "when a man has got an entrance into any of the sciences, it will be time then to depend on himself, and rely upon his own understanding, and exercise his own faculties, which is the only way to improvement and mastery." After recommending the study of history, he proceeds to observe, "The great end of such histories as Livy, is to give an account of the actions of men as embodied in society, and so of the true foundation of politics; but the flourishings and decays of commonwealths depending not barely on the present time for what is done within themselves, but commonly on remote and precedent constitution and events, and a train of concurrent actions amongst their neighbours as well as themselves; the order of time is absolutely necessary to a due knowledge and improvement of history, as the order of sentences in an author is necessary to be kept to make sense of what he says. With the reading of history, I think the study of morality should be joined; I mean not the ethics of the schools fitted to dispute, but such as Tully in his *Offices*, Puffendorf *de Officio Hominis et Civis*, *de Jure Naturali et Gentium*, and, above all, what the New Testament teaches, wherein a man may learn to live, which is the business of ethics, and not how to define and dispute about names of virtues and vices. True politics I look on as a part of moral philosophy, which is nothing but the art of conducting men right in society, and supporting a community amongst its neighbours."

[2] "Nosti præterea quam huic meæ methodo suffragantem habeam, qui eam intimius per omnia perspexerat utrique nostrum conjunctissimum dominum Joannem Locke; quo quidem viro, sive ingenio judicioque acri et subacto, sive etiam antiquis, hoc est, optimis moribus, vix superiorem quenquam, inter eos qui nunc sunt homines repertum iri confido, paucissimos certe pares." "The merit of this method, therefore," says Mr Stewart, in his Dissertation on the progress of Intellectual Philosophy, "which still continues to be regarded as a model by the most competent judges, may be presumed to have belonged in part to Mr Locke; a circumstance which deserves to be noticed, as an additional confirmation of what Bacon has so sagaciously taught concerning the dependence of all the sciences, relating to the phenomena either of matter or of mind, on principles and rules derived from the resources of a higher philosophy: on the other hand, no science could have been chosen more happily calculated than medicine to prepare such a mind as that of Locke for the prosecution of those speculations which have immortalized his name; the complicated and fugitive, and often equivocal, phenomena of disease, requiring in the observer a far greater portion of discriminating sagacity than those of physics strictly so called; resembling in this respect, much more nearly, the phenomena about which metaphysics, ethics, and politics, are conversant."

In 1665, Mr Locke accompanied Sir Walter Vane, as secretary, on his mission to the elector of Brandenburg; but he returned to England within the year, and went back to Oxford, where he resumed his studies with great vigour, and, in particular, applied himself to that of natural philosophy. He refused two offers of diplomatic employment, in Germany and Spain, which were made to him at different times; and he was also pressed by a friend, who had interest with the Duke of Ormond, then lord-lieutenant of Ireland, to take orders, and accept of considerable preferment in the Irish church. Mankind have reason to be thankful that this great man did not subside into a professional diplomatist; but there is no reason to conclude, as Lord King has done, that, had he accepted of preferment in the church, he would never have attained the name "of a great philosopher, who has extended the bounds of human knowledge." There appears, indeed, to be nothing in the peculiar duties of a divine which should incapacitate or disqualify him for engaging in scientific pursuits; and the annals, both of the English and of other churches, abound in examples of the successful cultivation of philosophy by their ministers. Berkeley was an Irish bishop; yet he unquestionably attained the name of a great philosopher, and, by his admirable Essay on Vision, extended the bounds of human knowledge.

In the year 1666, commenced Locke's acquaintance with Lord Ashley, afterwards Earl of Shaftesbury. His lordship had repaired to Oxford, with the intention of taking some mineral water for an abscess in the chest, under which he then laboured; and the physician to whom he applied, being absent, requested Locke to receive the distinguished visitor. Deeply versed in medical science, although he had not practised it professionally, Locke seems to have promptly divined the true mode of treatment for his lordship's complaint; whilst the charms of his conversation, in which wit, and sense, and learning were happily blended, could scarcely fail to make a deep impression upon a person of Shaftesbury's taste and discernment. Locke in his turn could not avoid being captivated by the brilliant qualities of a man whose genius and exemption from all vulgar corruption were sufficient to gloss over the most turbulent ambition, and the greatest sacrifice of principle and consistency which was ever, perhaps, made for its gratification. At the time when Locke made his acquaintance, he had, after serving the parliament in the civil wars, and being a zealous partisan of Cromwell during the protectorate, devoted himself to the cause of the restoration, and become a courtier of the sovereign from whom he derived his nobility. Mr Locke now accompanied Lord Ashley from Oxford to London; and having engaged him to submit to an operation which saved his life, such an intimacy grew up between them, that Locke was the inmate of Ashley House during a considerable part of every year, with the exception of three, which he spent abroad; and he was consulted by Shaftesbury upon all his most important private concerns. The part of his time which he did not spend with Lord Shaftesbury was passed at Oxford, where, as early as the year 1670, he appears to have sketched the plan of his Essay concerning Human Understanding. Lord King seems to think that this immortal work was completed in the following year; for he informs us that "the original copy, in Locke's own handwriting, dated 1671, is still preserved." But in this copy much must have been left to be added; for it was during his exile in Holland, as we learn from Leclerc, that Locke finished his Essay, and the year 1687 is mentioned as that in which it was completed. Besides, even after the work had been published, material and important additions were made to the subsequent editions, particularly the second and the fourth.

Towards the close of the year 1675, Locke went to reside in the south of France for the benefit of his health, and thus was happily absent during the disgraceful excesses connected with the pretended Popish Plot. Although his pure and tolerant principles must, with all right-thinking men, have exempted him from the least suspicion of encouraging Shaftesbury in the part which he then took, even if he had been residing with that unprincipled nobleman; yet it is fortunate for his fame, that the distance at which he then was from those dismal scenes deprives the most uncandid reasoner of every pretence for charging him with any participation in them. He kept a full and regular Journal of his travels from the day he landed at Calais; and one of the most curious and interesting portions of Lord King's work consists in the remarks upon men and things which he has extracted from it. Nor are any of these observations more instructive than those which convey to us an idea of the state of things which prevailed under the old government of France, the overthrow of which has been so bitterly lamented by a certain class of politicians in this country. Thus we find an estimate of the revenues of the Gallican church, according to which they amounted to not less than twenty-four millions sterling a year. The exemption of the lands of the nobility from taxes, as well as the ancient church lands, formed another glory of the old system, which the Revolution mercilessly swept away. The oppressive *gabelle*, or salt-duty, and the abuses of its farmers, as well as the laws for enforcing its collection, are also fully exposed. "The salt," says the Journal, "which the owner sells for five sous, the farmer sells again for fifteen;" and "the defrauding the duty is of such consequence, that if a man should be taken with but an handful of salt not bought from the farmers, he would be sent to the galleys." Nor was the corruption in the administration of justice less flagrant and odious than the iniquity of the financial system. "Many murders are committed here (at Montpelier). He that endeavoured to kill his sister in our house, had before killed a man, and it had cost his father five hundred crowns to get him off; by their secret distribution gaining the favour of their counsellors." Under such a system, the condition of the common people was, of course, most wretched. "Their ordinary food is rye-bread and water; flesh seldom seasons their pots; they can make no distinction between flesh and fasting days, but when their money reaches to a more costly meal, they buy the inwards of some beast in the market, and then feast themselves."

At Versailles, Mr Locke saw the other extreme of French society under the same happy dispensation. The queen sat on one hand of Louis XIV., and Madame de Montespan, his majesty's mistress, sat on the other, in the royal box at the opera. The latter also attended him in like manner at a hunting party. This monarch was, however, exceedingly punctual in his devotional exercises. "At the king's levee," says Mr Locke, "which I saw this morning, there is nothing so remarkable as his great devotion, which is very exemplary; for as soon as ever he is dressed, he goes to his bedside, where he kneels down to his prayers, several priests kneeling by him, in which posture he continues for a pretty while, not being disturbed by the noise and buzz of the rest of the chamber, which is full of people standing and talking to one another." Here we have a pretty conspicuous example of that blessed condition, "where prayers are morality, and kneeling is religion."

The same Journal contains some dissertations of very great value. The most complete and instructive of these is that upon Study. The sagacity and plain strong sense of Locke, and his freedom alike from the trammels of prejudice, or any affectation of originality, form the distinguishing features of this piece, as of all the illustrious author's works, and impress us with the persuasion, that if he differed from received opinion, it was simply for the love of truth, and not for the sake of appearing wiser than other men. In this discourse he lays it down that there are so many things to be known, whilst our time on earth is so short, that we must at once reject all useless learning. The first parcel of lumber which he condemns to be thrown over board, is all that maze of words and phrases invented to instruct people in the art of disputing, and abounding in the logic, physics, and divinity, of the schools. "Such words," he says, "no more improve the understanding than the motion of a jack will fill our bellies." Next he condemns a too great desire to know what opinions other men have entertained. He does not undervalue the light which we receive from others, nor think that there are not books which assist us mightily in our endeavours after knowledge; but he conceives that it is idle and useless to make it one's business to study what have been other men's sentiments in things where reason is, after all, the only judge. The third class of rejected studies consists of "purity of language, a polished style, or exact criticism in foreign tongues;" under which head, he says, are to be comprehended Greek and Latin, as well as French and Italian. To spend much time upon such niceties he considers as only labouring for an outside, a handsome dress of truth and falsehood, which may become fashionable gentlemen, but is unsuited to wise and useful men. But from this prohibition, which we cannot help thinking a great deal too broad, he specially excepts whatever amount of philological learning may be required for the right interpretation and understanding of the Scriptures; a case for which, according to his system, no sufficient provision is made, and which seems indeed to be excluded by the general prohibition. Another branch of proscribed study comprehends all "nice questions and remote useless speculations; as, where the earthly paradise was, what kind of bodies we shall have at the resurrection," and such like insoluble difficulties. The remarks upon useless historical study are judicious and discriminating; and the rest of the discourse is well worthy of attentive consideration, however much we may be disposed to dissent from some of the author's principles and views.

Amongst the lesser pieces which are inserted in the Journal under different dates, the most curious is one upon Religion, in which Tillotson's argument against the doctrine of the real presence, which is naturally turned by Hume into an argument against the possibility of miracles, is very clearly anticipated. He begins by affirming that the being and attributes of God can only be discovered and judged of by natural reason. Any other source of knowledge can only be inspiration; but even this, according to Mr Locke, cannot be admitted by any one who receives it, much less by any other to whom he tells it, as the ground of believing an alleged supernatural communication, excepting in as far as it is conformable to reason, which alone can enable either the one or the other to distinguish between inspiration and fancy, revelation and delusion. He holds it to be impossible that God should have made a creature to whom the knowledge of himself was necessary, and yet only imparted that knowledge by a channel through which all manner of errors are conveyed into the mind; "a channel much more likely to let in falsehoods than truths, since nobody can doubt, from the contradictions and strangeness of opinions concerning God and religion in this world, that men are likely to have more frenzies than inspirations." He next proceeds to inquire how far inspiration can enforce any opinion concerning God or his religion, when accompanied with a power to work miracles; and here again he maintains that "the last determination must be that of reason." His remarks upon religious enthusiasm are a continuation of the same argument; and although the definition of "enthusiasm" is not guarded by proper limitations, and consequently may admit of a dangerous extension, it ought at the same time to be kept in view that the sentiments of Locke upon this subject are those of a man who approved himself a sincere and devout advocate of the cause of Christianity. His observations concerning miracles bear date September 1681, and, consequently, must have been written a considerable time before Tillotson's discourse against transubstantiation, which appears to have been composed about the end of the reign of Charles II.[1]

Locke's return to England was accelerated by Shaftesbury, who had been taken into the ministry, and was now president of the council which the king had appointed, with the view of promoting conciliation. This measure, and the appointment of the popular leaders to office, was adopted by the advice of Sir William Temple; but the whole arrangement had not his concurrence, for he protested so vehemently against Lord Shaftesbury's admission, that it made him rather desire the whole plan should miscarry than be executed with such an addition.[1] It is also incorrect to represent Lord Shaftesbury's resignation as voluntary, and, like Lord Russell's, the consequence of the king proroguing the new parliament, chosen after he had dissolved the short one which succeeded the pensioned parliament, and passed the first exclusion bill and the *habeas corpus* act. Shaftesbury was deprived of his place as president of the council by the king, about the same time that he made the Duke of Monmouth retire to Holland, in consequence of the intrigues of Essex and Halifax, and the Duke of York's coming over, at their suggestion, on the occasion of the king's illness. This is the account given of the transaction by Temple; and Hume, though he makes Shaftesbury's removal take place at the date of the prorogation, yet is so far accurate that he does not describe him as resigning, but as dismissed. The account of this transaction given by Burnet is nearly the same with that of Temple.[2] Mr Locke arrived in England in May 1679, about a fortnight after the new council had been formed; and it may be presumed that he was living in his usual habits of familiar intercourse with Shaftesbury during that remarkable session when the exclusion and *habeas corpus* bills were powerfully supported by his lordship's talents and zeal. But the asthma, with which Mr Locke was afflicted, obliged him to pass the greater part of his time either at Oxford or in the west of England; notwithstanding which, several passages in his Journal plainly show his sense of the delirium which still prevailed upon the subject of the Popish Plot. The trials of the five Jesuits, and of Langhorne, the lawyer, were then going on, or in preparation; that of Sir George Wakeman, the queen's physician, took place in the month of July, when he was acquitted. This may be said to have terminated the frenzy, so disgraceful to the nation; for, excepting that of Strafford, Wakeman's was the last of the trials. Lord Shaftesbury was now in avowed opposition to the court; and for some time his party had every success that could be expected, short of passing the exclusion bill, in which they were always foiled by the House of Lords. The new parliament had been returned with a decisive majority in favour of the country party. The king dissolved it, and another of the very same description was chosen. This the king also dissolved suddenly in March 1681; and, within a month or two, the most humiliating spectacle which the history of popular fickleness presents, either in ancient or modern times, was exhibited by the people of England.

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[1] It is not a little remarkable that, a few years before this, Locke accidentally came near to one of the greatest discoveries of physical science, that of fixed air, which, a century afterwards, changed the whole face of chemistry. "M. Teinard produced a large bottle of muscat; it was clear when he set it on the table, but when he had drawn out the stopper, a multitude of little bubbles arose, and swelled the wine above the mouth of the bottle. It comes from this, that the air which was included and disseminated in the liquor, had liberty to expand itself, and to become visible, and, being much lighter than the liquor, to mount with great quickness. Q. Whether this be air new generated, or whether the springy particles of air in the fruits out of which these fermenting liquors are drawn, have by the artifice of nature been pressed close together, and thereby other particles fastened and held so; and whether fermentation does not loose these bonds and give them liberty to expand themselves again? Take a bottle of fermenting liquor, and tie a bladder on the mouth. Q. How much *new air* will it produce? *Whether this has the quality of common air?*"

The whole tide of popularity now turned in favour of the court and the king, and even the Duke of York. The sanguinary delusions of the Popish Plot seem to have stricken the infatuated nation with a kind of compunctious self-hatred, which was to be gratified only by rushing blindly to the opposite extremity. From grand juries, the bench of justices in the counties, cities, and boroughs, the franchises and corporations, many manors, the companies in towns, and, lastly, from the very apprentices, addresses were sent up, the purport of which was to declare unlimited confidence in the king, readiness to devote lives and fortunes to his service, condemnation of the exclusion bill, and charges of a seditious and even treasonable nature against the late parliament for having faithfully represented the sense, or rather the violence, of those very parties on the subject of popery and the Duke of York. As for the clergy, they struck up even a higher note of servility, evincing as much zeal for the duke's succession "as if a Popish king had been a special blessing of heaven to be much longed by a Protestant church."[3] The court perceived its advantage, and improved it by turning out of the commissions of the peace and the militia all whose attachment was considered as doubtful. And then began that campaign of judicial murders, which continued without pity or remorse until the end of this reign, and which plainly showed, as indeed the whole history of despotism in this island proves, that, with scarcely any exception, the judges of the land have ever been found the ready instruments of the most cruel and profligate of our tyrants. Indeed almost the only person who escaped their servile violence was the least deserving of those whom the court had resolved to destroy. Lord Shaftesbury being charged with high treason, the grand jury threw out the bill; but this was the last instance of resistance to the pleasure of the court. All the other victims of its malignity were regularly handed over to the "justice" then administered by the despot's ermined sycophants, who, we are authorized by legislative authority to say, murdered them in detail. As it was manifestly dangerous for Shaftesbury to rely upon the frail chance of a second escape, he retired to Holland, where he soon afterwards died; and his illustrious friend, deeming it unsafe to remain any longer in a country thus ruled and judged, went also into voluntary exile, about the close of the year 1683.[4]

At this period Locke was removed from his studentship at Christ Church, by virtue of an illegal order of the king, cheerfully, nay, almost thankfully, submitted to by the time-serving priest who then held the see at Oxford and the deanery of Christ Church. The common version of this memorable passage in his life, which treats it as an expulsion, and as the act of the university, is incorrect; it was merely a deprivation of his collegiate situation by the dean and chapter of the lesser body. The correspondence between the court of St James's and their wretched slaves of the university is very remarkable. In November 1684 Sunderland writes to Bishop Fell that the king understands that "one Mr Locke, who belonged to the late Lord Shaftesbury, and has on several occasions behaved himself very factiously and undutifully to the government, is a student of Christ Church," and adds, "that his majesty would have him removed from being a student, and that in order thereto the bishop would let them know the method of doing it." The answer of the right reverend prelate is instinct with unparalleled meanness and treachery. After stating that he had "for divers years had an eye upon" Locke, in order, no doubt, to find matter of charge against him, but that ("so close had his guard been of himself") all this episcopal espionage proved unavailing; and "although very frequently, both in public and in private, discourses have been purposely introduced, to the disparagement of his master the Earl of Shaftesbury, his party and designs, he could never be provoked to take any notice, or discover in word or look the least concern," Bishop Fell proceeds thus: "He has here a physician's place, which frees him from the exercise of the college, and the obligation which others have to residence in it, and he is now abroad upon want of health; but *notwithstanding that,* I have summoned him to return home; which is done with this prospect, that, if he *comes not back,* he will be liable to *expulsion for contumacy;* if he *does,* he will be *answerable to your lordship for what he shall be found to have done amiss;* it being probable, that though he may have been thus cautious here, where he knew himself to be suspected, he has laid himself more open in London, where a general liberty of speaking was used, and where the execrable designs against his majesty and his government were managed and pursued. If he does not return by the first day of January next, which is the time limited to him, I shall be enabled of course to proceed against him to expulsion. But if this method seem not *effectual or speedy enough,* and his majesty shall please to command his *immediate remove,* upon the receipt thereof, by the dean and chapter, it shall accordingly be executed." This letter is dated the 8th of November 1684. The immediate answer of Sunderland brings the grossly illegal order of the crown to deprive; and the bishop forthwith replies that it has been "fully executed," which elicits an expression of satisfaction on the part of the king "with the college's ready obedience;" an expression with which that learned body was probably satisfied, until its members should have occasion for some more substantial mark of approbation. But this is not all. There is still extant a letter by Bishop Fell, dated the 1st of June 1680, about four years before this, and addressed to Mr Locke himself, which proves that this right reverend pander of despotism, and forward tool of persecution, was the friend of the man whom he now showed himself so eager to betray.

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[1] Temple, *Memoirs from 1629 to his retirement.*

[2] Burnet, *History of his own Times*, vol. ii. p. 477.

[3] Burnet, *History of his own Times*, vol. ii. p. 501.

[4] That the mitre was not behind the ermine in the foul contamination of those times, abundant proof may be found, both in the general conduct of the church as described by Burnet, and in the strain composed by the heads of the hierarchy, to testify the gratitude of the nation for its enslavement. Lord King has given a form of prayer appointed for the thanksgiving holden upon the 9th of September 1683, which, he justly observes, "might have been supposed to proceed rather from the mufti and ulema, than from the bishops and rulers of the Christian church of England." They exult in the reflection that God "had given their gracious king, Charles, the necks of his enemies;" that is, of the virtuous Lord Russell, who had suffered, and of Sidney, who was yet to be delivered over to the inhuman Jefferies. They acknowledge that in all ages the Almighty has "shed forth his power in the miraculous protection of *righteous* and *religious* kings;" and "yield, from the very bottom of their hearts, *unfeigned* thanks" for the delivery of those two "righteous and religious" princes, Charles and James, from the "unnatural and hellish conspiracy of wicked and ungodly men." Upon these princes and their posterity they pray that the crown may forever flourish; and, under the form of a prayer for enemies, they pour out all imaginable abuse of their political antagonists, expressed in terms so gross that we shall not pollute the purity of this work by quoting them.

There can be but one opinion as to this prelate's base and treacherous conduct in the matter of Mr Locke's removal from his college; yet we must not shut our eyes to the lesson which is afforded by the proceeding of the court. It is a mistake to suppose that absolute princes are not so much to be abhorred as mean and petty tyrants, because they never come into conflict with individuals. Upon this subject, which he had long and profoundly considered, Mr Fox has, in his history, expressed a different opinion. "Thus," says he, "while, without the shadow of a crime, Mr Locke lost a situation attended with some emolument, and great convenience, was the university deprived of, or rather thus, from the base principles of servility, did she cast away, the man, the having produced whom is now her chiefest glory; and thus to those who are not determined to be blind, did the true nature of absolute power discover itself, against which the middling station is not more secure than the most exalted. Tyranny, when glutted with the blood of the great and the plunder of the rich, will condescend to hunt humbler game; and make the peaceable and innocent fellow of a college the object of its persecution. In this instance, one would almost imagine there was some instinctive sagacity in the government of that time, which pointed out to them, even before he had made himself known to the world, the man who was destined to be the most successful adversary of superstition and tyranny." It affords a striking confirmation of these remarks, that Charles, not satisfied with driving Locke from the situation which he held in England, and which in a great measure formed the means of his subsistence, followed him to the retreat abroad, where he had sought shelter from tyranny, and demanded, through his ambassador at the Hague, that the illustrious exile should be given up to his vengeance. Locke was therefore obliged to live in concealment during part of his residence in Holland; and it was about this time that he, appropriately enough, composed that admirable Letter on Toleration, which has ever since its publication been the chosen manual of the friends of religious liberty.

Mr Locke remained in exile until the Revolution, having refused many offers from powerful friends to obtain the king's permission to return. William Penn, amongst others, having some favour with James II., and probably fancying he had more, offered to procure him a pardon; but Locke nobly refused to accept one, being conscious of no offence.[1] Upon his return to England, he was pressed to accept a high diplomatic situation in Germany; but declined, partly from a modest apprehension of his insufficiency, and partly from an idea that his health would not stand the climate, and the service, of which he seems to have formed a somewhat unfavourable opinion. He states his reasons in a letter to Lord Mordaunt, afterwards Earl of Peterborough, in which he says, "I beg leave to tell your lordship, that if there be any thing wherein I may flatter myself I have any degree of capacity to serve his majesty, it is in some little knowledge I perhaps may have in the constitutions of my country, the temper of my countrymen, and the divisions amongst them; whereby I persuade myself I may be more useful to him at home, though I cannot but see that such an employment would be of greater advantage to myself abroad, would but my health consent to it."

His great work, the Essay concerning Human Understanding, was first published in the year 1690. The second edition appeared in 1694, the third in 1697, and the fourth in 1700.[2] The second edition received an additional chapter, namely, that on Identity; and the fourth, two more chapters, one on Association of Ideas, and another on Enthusiasm. Besides these entire chapters, various other partial additions and alterations were made by the author in the editions referred to. By this work Mr Locke soon became involved in several controversies. That with Stillingfleet, bishop of Worcester, is well known; and he also appears to have been teazed with another, which the third Lord Shaftesbury, the distinguished author of the Characteristics, insisted upon carrying on in private, by means of letters, which, though clever enough, are at the same time models of flippancy and affectation.

Soon afterwards, Locke took an active and most useful part in the great political discussions of the time. The toleration act, it is well known, was chiefly promoted by him, although he always lamented that it stopped so far short of the true point. His treatise on Civil Government, written in defence of the Revolution, against the Tories, and a second letter in defence of toleration, were both published in 1690. The act passed in 1662, establishing a censorship of the press, under pretence of preventing irreligious publications, remained in force, as is well known, until the year 1694, when it was allowed to expire, the House of Commons having refused to renew it. Upon that occasion Mr Locke probably prepared the curious and valuable piece which was first published by Lord King, and contains the author's observations upon the objectionable clauses of the bill. In considering these, it is interesting to observe that one of the substitutes for a licenser, which he points out, is the law passed above a century afterwards; whilst at the Revolution, when men's tempers were much heated, and their party differences ran as high as they ever did since, our ancestors were content to abolish the censorship, which had existed about thirty-two years, and to take no surety against the licentiousness of the press beyond that which had been provided by the common law. "I know not," says Mr Locke in the admirable piece referred to, "why a man should not have liberty to print whatever he would speak; and to be answerable for the one, just as he is for the other, if he transgresses the law in either."

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[1] Much about the same time, Penn busied himself with Bishop Burnet, and tried to bring him also over to England. The bishop, however, seems to have had but very little confidence in him. "He was," says he, "a talking vain man; he had such an opinion of his own faculty of persuading, that he thought none could stand before it; but he was singular in that opinion, for he had a tedious, luscious way, that was not apt to overcome a man's reason, though it might tire his patience." (Burnet, *History of his own Times,* vol. i. p. 693.) He tried to persuade the Prince of Orange, and indeed undertook to bring him into the king's measures, but of course without the least success. He also told Bishop Burnet many prophecies which he said he had from "a man that pretended to a commerce with angels." Amongst other things, he foretold, in 1686, that a change in the face of affairs would happen in 1688, and amaze all the world. But when, after the Revolution, Burnet asked him if that was the event, he had the rare candour to admit that he meant "the full settlement of the nation, upon a toleration, to quiet and unite all men's minds."

[2] Leclerc, *Bibliothèque Choisie,* tom. vi. p. 379.

About the same period commenced the intimacy between Newton and Locke, which forms so interesting a part of their biography. Of that memorable friendship some curious and instructive monuments have been preserved. One of these will more particularly interest mathematicians. It is a demonstration of the fundamental proposition in the *Principia*, and its principal corollary; and we presume that it must have been drawn out for the purpose of explaining the matter fully to Locke. Lord King informs us that the paper containing it is indorsed "Mr Newton, March 1689;" and thinks that it was communicated before the publication of the *Principia*. But however the indorsement may be accounted for, this is a mistake; the *Principia* having, as is well known, been published in 1687. The demonstration begins with three hypotheses, of which two are the first axioms or laws of motion, and the third is the first corollary to the third axiom in b. i. prop. 1 of the *Principia*. Then follows the important proposition of the radius-vector describing equal areas in equal times, being the well-known proposition first of the second section, and demonstrated in nearly the same manner in which it is there given. Next comes the first proposition of the third section, in substance, but given in the form of a theorem upon the law of attraction applied to bodies moving in elliptical orbits. The construction and demonstration differ materially from those contained in the *Principia;* and three lemmas are prefixed, the substance of one of which may be recognised in the early part of the demonstration given in the *Principia*, whilst it forms the subject of a note in the Jesuits' commentary on that proposition. These lemmas being expressed in a more explanatory form than those of the *Principia* usually are, we may hence conclude, that Newton's illustrious pupil had required him to state as plainly as possible the grounds of his fundamental doctrine.

But these things, however interesting to mathematicians, will not arrest the attention of the general reader so much as the very curious correspondence between Newton and Locke, which Lord King has given to the world. Part of this correspondence relates to the letter which Newton had addressed to Locke upon the famous verse in John (1 John, v. 7), and the controverted passage in Timothy (1 Tim. iii. 16). He had been desirous at one time to have his researches upon these texts published; but being anxious to avoid controversy, and aware of the virulence with which he would be attacked as soon as his theory became known, he begged Locke to get it translated into French and published on the Continent. Locke, therefore, sent the manuscript to his friend and correspondent Leclerc, without disclosing the name of the author, for the purpose of having it translated and published in Holland. But some time afterwards Newton appears to have become alarmed at the risk of being discovered; and on the 16th of February 1692, he addressed a letter to Mr Locke, in which he says, "Let me entreat you to stop the translation and impression so soon as you can; for I design to suppress them." Accordingly, Leclerc did not proceed with the publication, but retained the papers until Locke's death in 1704, and, never having been informed to whom they belonged, deposited them in the library of the Remonstrants, where they were found, and published in 1754. Other parts of Newton's correspondence relate to his opinions upon passages in the Prophecies, which appear to have engrossed a large share of his attention, especially after he had ceased to devote himself so unremittingly to science as he did in the early part of his life.

But the most singular part of this correspondence relates to that affecting passage in Newton's life, in which it appears that his great mind, whether from bodily ailment, some original morbid predisposition, or from too vast a burden being imposed upon it, had, for a season, been liable to aberrations. And, in the first place, we shall refer to the authority upon which this passage in the history of Newton's life rests; a fact of which so melancholy a confirmation is afforded by his correspondence with Mr Locke. In a manuscript diary of Huygens, preserved in the library of Leyden, there is a note, in which it is stated that, on the 29th of May 1694, a Scotchman of the name of Colin (or Collins) informed him, that, eighteen months before, Newton had become deranged, in consequence either of too severe application, or of distress occasioned by the loss of his papers, which were accidentally burned; that his alienation had first appeared in a conference with the archbishop; and that, having been confined by his friends, he gradually recovered, so as of late (that is, prior to the date of Colin's communication to Huygens) to have become capable of resuming his pursuits. This would carry back the period of his being taken ill to December 1692; and there is at Cambridge a manuscript letter of Mr de la Pryne, dated in February 1693, in which the well-known circumstance of the burning of the papers containing his calculations, by a lap-dog, is mentioned, and a statement added, that Newton "was so troubled thereat, that every one thought he would have run mad, and he was not himself for a month after."[1] These facts would seem to fix the winter of 1692–1693 as the period at which this malady commenced.

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[1] This shows how wide of the truth is the common version of the anecdote, which gives it as a striking instance of Newton's extreme composure and patience, that he contented himself with exclaiming to the little dog, "Diamond, thou little knowest what mischief thou hast done!" The absurdity of this, and some other anecdotes of a similar kind, consists in the supposition upon which they all proceed, that Newton was raised above the ordinary impulses, feelings, and weaknesses of humanity. But there is no evidence of any kind to show that he was exempted from the common frailties of our nature, and some which goes to establish the contrary. In "patient thinking," no one, dead or living, ever approached him; but his temper could occasionally be ruffled, like that of any other man; and in such cases, it is highly improbable that excited feelings would find expression in a miserable scrap of sentiment. When provoked with Flamsteed, he called the astronomer royal "a puppy," just as any body else would have done in similar circumstances.

A degree of irritability and suspicion may, however, be discerned in his correspondence during the earlier part of the year 1692. The letter written to Mr Locke, concerning the papers which had been sent to Leclerc, betrays morbid feeling; and there is one respecting Mr Montague, afterwards Lord Halifax, which is tinged with very unmerited suspicions of that person. "Being fully convinced," says he, "that Mr Montague, upon an old grudge which I thought had been worn out, is false to me, I have done with him." Mr Montague had been his colleague in the representation of Cambridge; and having always had the highest esteem for Newton, obtained for him, a few years afterwards, the office of Master of the Mint. There is likewise another letter, dated in August of the same year, containing a good deal of suspicion insinuated against Mr Boyle. But these indications would have excited no rash observation, had they not been followed by the letters of the next year. In one dated in September 1693, addressed to Mr Locke, he says, "Being of opinion that you endeavoured to embroil me with women, and by other means, I was so much affected with it, as that when one told me you were sickly and would not live, I answered, 'twere better you were dead. I desire you to forgive me this uncharitableness. For I am now satisfied that what you have done is just, and I beg your pardon for my having hard thoughts of you for it, and for representing that you struck at the root of morality, in a principle you laid [down] in your book of ideas, and designed to pursue in another book, and that I took you for a Hobbist." Locke's answer is admirable; full of excellent and amiable feeling towards his illustrious friend, and, at the same time, breathing the dignity of a mind wholly unconscious of offence. It is dated at Oates, 5th of October 1693. "I have been, ever since I first knew you, so entirely and sincerely your friend," says Mr Locke, "and thought you so much mine, that I could not have believed what you tell me of yourself, had I had it from any body else. And though I cannot but be mightily troubled that you should have had so many wrong and unjust thoughts of me, yet, next to the return of good offices, such as from a sincere good will I have ever done you, I receive your acknowledgment of the contrary as the kindest thing you could have done me, since it gives me hopes I have not lost a friend I so much valued. After what your letter expresses, I shall not need to say anything to justify myself to you. I shall always think your own reflection on my carriage, both to you and all mankind, will sufficiently do that. Instead of that, give me leave to assure you, that I am more ready to forgive you than you can be to desire it; and I do it so freely and fully, that I wish for nothing more than the opportunity to convince you that I truly love and esteem you; and that I have still the same good will for you as if nothing of this had happened. To confirm this to you more fully, I should be glad to meet you anywhere; and the rather, because the conclusion of your letter makes me apprehend that it would not be wholly useless to you. But whether you think it fit or not, I leave wholly to you. I shall always be ready to serve you to my utmost, in any way you shall like, and shall only need your commands or permission to do it." The letter which this called forth from Newton shows plainly the unhappy state to which he must have been reduced. "The last winter," says he, "by sleeping too often by my fire, I got an ill habit of sleeping; and a distemper, which this summer has been epidemical, put me farther out of order, so that when I wrote you, I had not slept an hour a night for a fortnight together, and for five nights together not a wink. I remember I wrote to you, but what I said of your book I remember not." Here we have direct evidence that the mind of this illustrious man had been in a state of obscuration, and that the temporary darkness was beginning to be dispelled. These disclosures may also serve to explain the otherwise remarkable fact, that Newton had completed all his discoveries in science before attaining the age of forty-five, and that he did little or nothing after that, although he lived in the enjoyment of health forty years longer.

In 1695, Mr Locke was appointed a commissioner of trade and plantations. For this office, worth about L.1000 a year, he was indebted to the friendship of Lord Somers, who reposed great confidence in him, and paid much deference to his judgment in the practical details of politics. About the same time the bad state of the coin was such as to call for the attention of the government. The practical men, as they delight to call themselves, though they are often the most fanciful of speculators (only that their theory being founded on a partial view of a few facts, and therefore necessarily false, assumes the shape of detail), recommended as the obvious remedy an alteration of the standard; but, happily for the credit and the interest of the country, it had at that time ministers both honest and sagacious enough to pursue a different course. Lord Somers and Sir William Turnbull preferred the counsels of Mr Locke to those of Mr Lowndes and his practical friends, and the great measure of the recoinage was carried through. The difference between the embarrassments which affected the currency in the reign of William III. and those which have occurred in our own time, are well stated by Lord King in his Life of Locke. "The coin, at the period first mentioned, had been deteriorated by the frauds of individuals and the neglect of the public; but when the evil was felt, and the remedy pointed out, the parliament, notwithstanding the pressure of the war, and the false theories of the practical men of those days, applied the proper remedy at the proper time, before any great permanent debt had been incurred. In our own time, the depreciation of the currency was entirely to be attributed to the bank and the government. The paper-money of a banking company, without the one indispensable security against it, payment in specie on demand, was in an evil hour substituted in place of the king's lawful coin; and in order that the minister might avoid the imputation of being an unskilful financier, who borrowed money on unfavourable terms, a debt of unexampled magnitude was accumulated in a debased currency, to be ultimately discharged in specie at the full and lawful standard. It must be confessed, that by the tardy act of retributive justice, which was passed in 1819, the punishment inflicted upon the nation was in the exact proportion to the former deviations from good faith and sound principle; and we may at least hope that the severity of the penalty will in future prevent a repetition of the same folly."

The increasing infirmities of Mr Locke, arising from his asthmatic complaint, induced him, in 1700, to resign his seat at the board of trade, notwithstanding the pressing instances of Lord Chancellor Somers. He felt an invincible repugnance to retain the office when he found that, from the state of his health, he must leave a great portion of its duties unperformed. For the same reason, he declined a proposal of another and apparently a higher situation, made to him by the king himself, who sent for him to Kensington that he might persuade him to accept it. The air of London appears to have been unfavourable to his ailment; and he spent the last four years of his life at the seat of Sir Francis and Lady Masham, at Oates, in Essex, where he had occasionally resided during many preceding years. In this hospitable and friendly retreat, his chief occupation consisted in the study of the Scriptures, an employment in which he found so much gratification that he regretted not having devoted more of his time to it in the earlier part of his life. But, though thus occupied, his affection for his friends and his love of his country suffered no diminution. His correspondence, at this period, with his cousin Sir Peter, afterwards Lord Chancellor King, is full of the gentlest affection, mixed with his wonted sagacity, and breathing the warmest attachment to the liberties of his country.

In 1703, Locke suffered severely from the asthmatic complaint with which he had been so long afflicted; but though labouring under an incurable disorder, his natural cheerfulness never forsook him, and, whilst perfectly resigned to his own fate, he continued to the last deeply interested in the welfare of his friends. His literary occupation at this time was the study of, and preparation of a commentary on, St Paul's Epistles, afterwards published amongst his posthumous works. In October 1704, his malady had greatly increased. On the 27th of that month, Lady Masham, not finding him in his study as usual, went to his bedside, when he told her that the fatigue of getting up the day before had been too much for his strength, and that he never expected to rise again from his bed. He had now, he said, finished his career in this world, and in all probability would not outlive the night, certainly not survive beyond the next day or two. After taking some refreshment, he observed to those present that he wished them all happiness when he was gone. To Lady Masham, who remained with him, and whose kind attentions had soothed so many hours of hopeless suffering, he said that he thanked God he had passed a happy life, but that now he found that all was vanity; and he earnestly exhorted her to consider this life as only a preparation for a better and happier state hereafter. He would not suffer her to watch by him during the night, observing, that perhaps he might be able to sleep; but that if any change should happen, he would send for her. Having had no sleep in the night, he was taken out of bed, and carried into his study, where he slept for some time in his chair. When he awoke he desired to be dressed, and then heard Lady Masham read the Psalms, apparently with great attention, until, perceiving that his end drew near, he stopped her, and a few minutes afterwards expired, about three o'clock in the evening of the 28th of October, in the seventy-third year of his age.

It is difficult to say whether mankind have been more indebted to this illustrious man as a philosopher or as a politician. The publication of his great work, the Essay concerning Human Understanding, undoubtedly fixed an era in the history of intellectual science. On this subject, however, it is only necessary here to refer the reader to the First Preliminary Dissertation (Part ii. sect. i. p. 100, et seq.), where the highest attainments in philosophy, an eloquence worthy of Plato himself, and a cautious, discriminating sagacity, all happily combined, have been employed in the exposition of Locke's speculative labours. But his writings and his personal exertions in favour of liberty, and more especially of religious toleration, may truly be said to have produced a greater effect than can be ascribed to the efforts of perhaps any other individual who bore a part in the transactions of the important period immediately succeeding the Revolution. The true doctrines of toleration were first promulgated by him in their full extent; he asserted the principle in its greatest amplitude, that opinion is not a matter cognizable by the civil magistrate, and that belief, being the result of reason, is wholly independent of the will, and the subject neither of praise nor of censure, far less the object of punishment or reward. It is well known, indeed, that intolerance had not ceased at the Reformation; that the Protestant church had not put an end to persecution. The influence of the Reformation had, do doubt, been salutary in this, as in other respects; but persecution had been mitigated by very slow degrees; and, in its early stages, the reformed church was to the full as intolerant, and nearly as persecuting, as the hierarchy which it had supplanted. In proof of this, it is only necessary to refer to the numerous executions of Catholics, and even of Protestant dissenters, in the reign of Queen Elizabeth; executions which were not unfrequently accompanied by the most cruel tortures.[1] At a later period, the Episcopalian church of Scotland not only equalled, but even surpassed the cruelties of the older times; and the intolerance of the Presbyterians during the whole of the seventeenth century is too well known to require any particular exposition. It is from the era of the Revolution that we must date the establishment of that toleration which the Reformation had in no respect secured; and it has been reserved for our own times to carry the principles of Locke to their full extent, and to supply those deficiencies in the scheme of religious freedom which he and his coadjutors were unfortunately obliged to leave in their great work. In the matter of civil government, the obligations of mankind generally, and of his countrymen in particular, to the genius, the wisdom, and the sagacity of Locke, are not less conspicuous and important. He it was who not only exposed the folly, as well as injustice, of the slavish doctrines which had hitherto prevailed, but who placed upon a solid foundation the true principles of legislation and government.

All the works of this great man have been collected, and frequently reprinted in different forms. They consist of, 1. Three Letters upon Toleration, the first (in Latin) printed at London in 1689; 2. A Register of the Changes of the Air observed at Oxford, inserted in Mr Boyle's *General History of the Air*, 1692; 3. New Method for a Commonplace Book, 1686; 4. Essay concerning Human Understanding, 1690; 5. Treatises of Civil Government, 1690, 1694, and 1698; 6. Some Considerations of the Consequences of lowering the Interest and raising the Value of Money, 1691 and 1695; 7. Observations on a printed paper entitled *For coining Silver Money in England;* 8. Farther Observations concerning the raising the Value of Money; 9. Some Thoughts concerning Education, 1695; 10. The Reasonableness of Christianity, 1695; 11. Vindication of the Reasonableness, 1695; 12. A Second Vindication, 1696; 13. A Letter to the Bishop of Rochester, 1697; 14. Reply to the Bishop of Rochester, 1697; 15. Reply, in answer to the Bishop's second Letter, 1698; 16. Posthumous works of Mr John Locke, containing, Of the Conduct of the Understanding, intended as a supplement to the Essay, An examination of Malebranche's Opinion that we see all things in God, A Discourse of Miracles, part of a Fourth Letter on Toleration, Memoirs relating to the Life of Anthony first Earl of Shaftesbury, &c. At his death he left several manuscripts, from which his executors, Sir Peter King and Mr Anthony Collins, published, in 1705, his paraphrase and notes upon St Paul's Epistle to

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[1] Of the persecuting spirit of that age it is scarcely possible for us to form any adequate conception. Fox, the martyrologist, addressed to Queen Elizabeth an earnest entreaty that she would be pleased to put a stop, not to persecution, but only to the *burning* of the Anabaptists in Smithfield. He seems to have thought it a great deal too much to seek that no punishments, even no capital punishments, should be inflicted for the crime of dissent; he merely begs that such "horrors" as burning should be disallowed. "There are chains," says Fox, "there is exile, there are branding and stripes, and even the gibbet; this alone (burning) I earnestly deprece." It is only one form of cruelty that shocks the soul of the martyrologist; he seems to have felt great "horror" at the infliction of death by fire; but he makes no objection to the application of such other specifics, in case of non-conformity or dissent, as chains, exile, branding, stripes, and even the gallows itself. Disallow fire, and he is satisfied. What a picture does this exhibit of the glorious reign of "the good Queen Bess!"

the Galatians, which were soon followed by those upon the Corinthians, Romans, and Ephesians, with an Essay prefixed for the understanding of St Paul's Epistles, by consulting St Paul himself. In 1708 were likewise published some familiar letters which passed between Mr Locke and several of his friends. (See Lord King's *Life of John Locke*, London, 1829, in 4to; and particularly the *Edinburgh Review*, vol. l. p. 1, et seq.) (A.)

LOCLE, a market-town of the province of Valangin, in the canton of Neufchatel, in Switzerland. It is 1487 feet above the level of the sea, being situated in a deep valley of the Jura Mountains. It contains 489 houses, and 4670 inhabitants. It is remarkable as being the first place where a watch was made by John Ri, who taught the art to his neighbours, who have since continued the operation. Hosiery and thread-lace are now also made. Long. 6. 49. 35. E. Lat. 47. 3. 15. N.

LOCMINE, a town of France, in the department of Morbihan, and arrondissement of Pontivy. It contains 1700 inhabitants, but within the bounds of the parish there are 9500 persons.

LOCRI, or Locri Epizephyrii, in *Ancient Geography*, a town on the Ionian Sea, near the promontory Zephyrium. The inhabitants are said to be the first who used a code of written laws.

LOCUS Geometricus, a line by which a local or indeterminate problem is solved. A *locus* is a line, any point of which may equally solve an indeterminate problem. Thus, if a right line suffice for the construction of the equation, it is called *locus ad rectum;* if a circle, *locus ad circulum;* if a parabola, *locus ad parabolam;* if an ellipsis, *locus ad ellipsin;* and so of the rest of the conic sections.

LOCUTIUS, in *Mythology*, the god of speech amongst the Romans, called by Livy *Anis Locutius.*

LOCUTORIUM, a hall or apartment in monasteries, where the monks and other religious persons met after dinner to converse.

LODDON, a market-town of the county of Norfolk, and hundred of its own name, 111 miles from London, and five from Bungay. The market is held on Saturday, but is inconsiderable. The population amounted in 1801 to 799, in 1811 to 937, in 1821 to 1038, and in 1831 to 1175.

LODEVE, an arrondissement of the department of the Hérault, in France, 522 square miles in extent. It comprehends five cantons, divided into seventy-five communes, containing 51,500 inhabitants. The chief place is the city of the same name, situated between two lofty mountains, at the foot of the Cevennes, on the river Ergue. It contains 840 houses, and 850 inhabitants. It is an ill-built but an industrious place, yielding, besides much wine, woollens, silks, and hats, olive oil, and brandy. Long. 3. 15. E. Lat. 43. 47. N.

LODGEMENT, in military affairs, a work made by the besiegers in some part of a fortification, after the besieged have been driven out, in order to maintain it, and cover themselves from the enemy's fire.

LODI, a delegation or province within the government of Milan, in the Austrian kingdom of Venetian Lombardy. It is surrounded by the other Austrian provinces of Bergamo, Cremona, Pavia, and Milan. It extends over 709 square miles, and comprehends two cities, eight market-towns, 189 villages, with 27,726 houses, and 195,485 inhabitants. It is well watered by various streams, some running to the Po, and others to the Adda; and the whole is fertile. The district around the city comprehends some of the richest lands of the Austro-Italian dominions. It is chiefly a rich pasture, upon which the largest herds of cows are fed. The dairies are managed with much skill and attention, and yield the greater part of that rich cheese known in most parts of Europe by the name Parmesan, but which in Italy is commonly described by the name of this city, as *Fromaggio Lodisana.* The capital is the city of the same name, situated on the river Adda, over which is a bridge that was the scene of one of the most daring and successful events of the early years of Bonaparte's military career. It is an old, extensive city, the see of a bishop, and of the provincial courts of law. It contains a cathedral and nineteen other churches, and 1412 houses, with 17,812 inhabitants. There is a fine theatre, a royal college, and an institution of a collegiate kind for the education of females. The chief employment consists in spinning and weaving silk, and there are also some manufactures of earthenware and china. Long. 9. 25. 32. E. Lat. 45. 18. 31. N.

LOG, in the Jewish antiquities, a measure which contained a quarter of a cab, and consequently five sixths of a pint. There is mention made of a log (2 Kings, vi. 25) under the name of a *fourth part of a cab.* But in Leviticus the word log often signifies the measure of oil which lepers were to offer at the temple after they were cured of their disease. Dr Arbuthnot thinks that the log was a measure of liquids, the seventy-second part of the bath or ephah, and the twelfth part of the hin.

Log, a nautical term, signifying a small piece of timber, of a triangular, sectoral, or quadrantal figure, generally about a quarter of an inch thick, and five or six inches from the angular point to the circumference. It is balanced by a thin plate of lead, nailed to the arch, or circular side, so as to swim perpendicularly in the water.

Log-Line, a little cord or line, fastened to the log by means of two legs, one of which passes through a hole at the corner, and is knotted on the opposite side, whilst the other leg is attached to the arch by a pin fixed into another hole, so as to draw out occasionally. By these legs the log is suspended in equilibrio; and the line thus annexed to it is wound round a reel, fixed for that purpose in the gallery of the ship.

The use of the log and log-line is to keep account and make an estimate of the ship's way or distance run, which is done by observing the length of line unwound in half a minute's time, told by a half-minute glass; for so many knots as run out in that time, so many miles the ship sails in an hour. Thus, if there be four knots veered out in half a minute, the ship is computed to run four miles an hour. The author of this device for measuring the ship's way is not known; and no mention of it occurs till the year 1607, in an East India voyage published by Purchas; but from that time its name occurs in other voyages amongst his collections, and henceforward it was noticed both by our own authors and by foreigners; as by Gunter in 1623, Snellius in 1624, and by almost all the succeeding writers on navigation.

The log is a very precarious mode of computation, and must always be corrected by experience, much uncertainty arising from the motions of the ship, the winds of variable force, the friction of the reel, and the lightness of the log in the course of the current. See Navigation.

Perpetual Log, a machine so called by its inventor, Mr Gottlieb of London, is intended for keeping a constant and regular account of the rate of a ship's velocity in the interval of heaving the log.

Log-Board, a sort of table, divided into several columns, containing the hours of the day and night, the direction of the winds, the course of the ship, and all the material occurrences that happen during the twenty-four hours, or from noon to noon; together with the latitude by observation. From this table the officers of the ship are furnished with materials for compiling their journals.

Log-Book, a book into which the contents of the log-board are daily copied at noon, together with every circumstance deserving notice which happens to the ship, either at sea or in harbour.

LOGARITHMS.

I.—HISTORY OF LOGARITHMS.

THE labour and time required for performing the arithmetical operations of multiplication, division, and the extraction of roots, were at one time considerable obstacles to the improvement of various branches of knowledge, and in particular the science of astronomy. But about the end of the sixteenth century and the beginning of the seventeenth, several mathematicians began to consider by what means they might simplify these operations, or substitute for them others more easily performed. Their efforts produced some ingenious contrivances for abridging calculations; but of these the most complete by far was that of John Napier, baron of Merchiston, in Scotland, who invented a system of numbers called *logarithms,* so adapted to the numbers to be multiplied or divided, that these being arranged in the form of a table, each opposite the number called its logarithm, the product of any two numbers in the table was found opposite that formed by the addition of their logarithms; and, on the contrary, the quotient arising from the division of one number by another was found opposite that formed by the subtraction of the logarithm of the divisor from that of the dividend; and similar simplifications took place in the still more laborious operations of involution and evolution. But before we proceed to relate more particularly the circumstances of this invention, it will be proper to give a general view of the nature of logarithms, and of the circumstances which render them of use in calculation.

Let there be formed two series of numbers, the one constituting a geometrical progression, whose first term is unity or 1, and the common ratio any number whatever; and the other an arithmetical progression, whose first term is 0, and the common difference also any number whatever; for example, suppose the common ratio of the geometrical series to be 2, and the common difference of the arithmetical series 1, and let them be written thus:

Geom. Prog.		Arith. Prog.
1	-	0
2	-	1
4	-	2
8	-	3
16	-	4
32	-	5
64	-	6
128	-	7
256	-	8
512	-	9
1024	-	10
2048	-	11
4096	-	12
&c.		&c.

Here the terms in the arithmetical series are called the *logarithms* of the corresponding terms of the geometrical series; that is, 0 is the logarithm of 1, and 1 is the logarithm of 2, and 2 is the logarithm of 4, and 3 that of 8, and so on.

From the manner in which the two series are related to each other, it will readily appear by induction that the logarithms of the terms of the geometrical series have the two following properties:

1. The sum of the logarithms of any two numbers or terms in the geometrical series is the logarithm of that number, or term of the series, which is equal to their product.

For example, let the terms of the geometrical series be 4 and 32; the corresponding terms of the arithmetical series (that is, their logarithms) are 2 and 5: now the product of the numbers is 128, and the sum of their logarithms is 7; and it appears by inspection of the two series, that the latter number is the logarithm of the former, agreeing with the proposition we are illustrating. In like manner, if the numbers or terms of the geometrical series be 16 and 64, the logarithms of which are 4 and 6, we find from the table that $10=4+6$ is the logarithm of $1024=16\times 64$; and so of any other numbers in the table.

2. The difference of the logarithms of any two numbers or terms of the geometrical series is the logarithm of that term which is the quotient arising from the division of the one number by the other.

Take, for example, the terms 128 and 32, the logarithms of which are 7 and 5; the greater of these numbers divided by the less is 4, and the difference of their logarithms is 2; and by inspecting the two series, this last number will be found to be the logarithm of the former. In like manner, if the terms of the geometrical series be 1024 and 16, the logarithms of which are 10 and 4, we find that $1024\div 16=64$, and that $10-4=6$; now, in the table, the latter number, viz. 6, is the logarithm of the former, 64.

These two properties of logarithms, the second of which indeed is an immediate consequence of the first, enable us to find with great facility the product or the quotient of any two terms of a geometrical series to which there is adapted an arithmetical series, so that each number has its logarithm opposite to it, as in the preceding short table. For it is evident, that to multiply two numbers, we have only to add their logarithms, and opposite to that logarithm which is the sum we shall find the product required. Thus, to multiply 16 by 128; to 4 the logarithm of 16, add 7 the logarithm of 128, and opposite the sum 11, we find 2048, the product sought. On the other hand, to divide any number in the table by any other, we subtract the logarithm of the divisor from that of the dividend, and look for the remainder among the logarithms, and opposite to it we find the number sought. Thus, to divide 2048 by 128; from 11, the logarithm of 2048, we subtract 7, the logarithm of 128, and opposite the remainder 4, we find 16, the quotient sought.

Let us now suppose any number of geometrical means to be interposed between each two adjoining terms of the preceding geometrical series, and the same number of arithmetical means between every two adjoining terms of the arithmetical series; then, as the results will still be a geometrical and an arithmetical series, the interpolated terms of the latter will be the logarithms of the corresponding terms of the former, and the two new series will have the very same properties as the original series.

If we suppose the number of interpolated means to be very great, it will follow that among the terms of the resulting geometrical series, some one or other will be found nearly equal to any proposed number whatever. Therefore, although the preceding table exhibits the logarithms of 1, 2, 4, 8, 16, &c. but does not contain those of the intermediate numbers, 3, 5, 6, 7, 9, 10, &c. yet it is easy to conceive that a table might be formed by interpolation which should contain, amongst the terms of the geometrical series, all numbers whatever to a certain extent (or at least others very nearly equal to them), together with their logarithms. If such a table were constructed, or at least if such terms of the geometrical progression were found, together with their logarithms, as were either accurately equal to, or coincided nearly with, all numbers within certain limits (for example, between 1 and 100,000), then, as often as we had occasion to multiply or divide any numbers contained in that table, we might evidently obtain the products or quotients by the simple operations of addition and subtraction.

The first invention of logarithms has been attributed by some to Longomontanus, and by others to Juste Byrge, two mathematicians contemporary with Napier; but there is no reason to suppose that either of these anticipated him, for Longomontanus never published any thing on the subject, although he lived thirty-three years after Napier had made known his discovery; and as to Byrge, he is indeed known to have printed a table containing an arithmetical and a geometrical progression written opposite to each other, so as to form in effect a system of logarithms of the same kind as those invented by Napier, without however explaining their nature and use, although it appears from the title he intended to do so, but was probably prevented by some cause unknown to us. But this work was not printed till 1620, six years after Napier had published his discovery, namely, in 1614, in a book entitled *Mirifici Logarithmorum Canonis Descriptio;* but he reserved the construction of the numbers till the opinion of the learned concerning his invention should be known. It is therefore with good reason that Napier is now universally considered as the first, and most probably the only inventor. His work contains a table of the natural sines and cosines, and their logarithms, for every minute of the quadrant, as also the differences between the logarithmic sines and cosines, which are in effect the logarithmic tangents. There is no table of the logarithms of numbers; but precepts are given, by which they, as well as the logarithmic tangents, may be found from the table of natural and logarithmic sines.

In explaining the nature of logarithms, Napier supposes some determinate line which represents the radius of a circle to be continually diminished, so as to have successively all possible values, and thus to be equal to every sine, one after another, throughout the quadrant. And he supposes this diminution to be effected by a point moving from one extremity towards the other extremity (or rather some point very near it), with a motion that is not uniform, but decreases gradually in such a manner, that if the whole time between the beginning and the end of the motion be conceived to be divided into a very great number of equal portions, the decrements taken away in each of these shall be to one another as the respective remainders of the line. According to this mode of conceiving the line to decrease, it is easy to show that at the end of any successive equal intervals of time from the beginning of the motion, the portions of the line which remain will constitute a decreasing geometrical progression.

Again, he supposes another line to be generated by a point which moves along it equably, or which passes over equal intervals of it in equal times. Thus the portions of the line generated at the end of any equal successive intervals of time from the beginning of the motion will form a series of quantities in arithmetical progression. Now if the two motions be supposed to begin together, the remainders of the one line at the end of any equal intervals of time will form a series of quantities in geometrical progression, while the corresponding portions generated of the other line will constitute a series in arithmetical progression, so that the latter will be the logarithms of the former. And as the terms of the geometrical progression decrease continually from radius, which is the greatest term, to 0, while the terms of the corresponding arithmetical progression increase from 0 upwards, according to Napier's system the logarithm of radius is 0, and the logarithms of the sines from radius down to 0 are a series of numbers increasing from 0 to infinity.

The velocities or degrees of quickness with which the motions commence may have to each other any ratio whatever, and by assuming different ratios we obtain different systems of logarithms. Napier supposed the initial velocities to be equal; but the system of logarithms produced in consequence of this assumption having been found to have some disadvantages, it has been long superseded by a more convenient one, as we shall presently have occasion to explain.

Napier's work having been written in Latin, was translated into English by Mr Edward Wright, an ingenious mathematician of that period, and inventor of the principles of what is commonly though erroneously called *Mercator's sailing.* The translation being sent to Napier for his perusal, was returned with his approbation, and with the addition of a few lines, intimating that he intended to make some alterations in the system of logarithms in a second edition. Mr Wright died soon after he received back his translation; but it was published after his death in 1616, accompanied with a dedication by his son to the East India Company, and a preface by Henry Briggs, who afterwards distinguished himself by improving the form or system of logarithms. Mr Briggs likewise gave in this work the description and draught of a scale which had been invented by Wright, as also various methods of his own for finding a logarithm to a given number, and a number to a given logarithm, by means of Napier's table, the use of which had been attended with some inconvenience, on account of its containing only such numbers as were the natural sines to every minute of the quadrant and their logarithms. There was an additional inconvenience in using the table, arising from the logarithms being partly positive and partly negative. The latter of these was, however, well remedied by John Speidell in his *New Logarithms*, first published in 1619, which contained the sines, cosines, tangents, cotangents, secants, and cosecants, and given in such a form as to be all positive; and the former was still more completely removed by an additional table, which he gave in the sixth impression of his work in 1624, and which contained the logarithms of the integers 1, 2, 3, 4, &c. to 1000, together with their differences and arithmetical complements, &c. This table, which is of great use in finding fluents, is commonly called *hyperbolic logarithms*, because the numbers serve to express the areas contained between a hyperbola and its asymptote, and limited by ordinates drawn parallel to the other asymptote. This name, however, is certainly improper, as the same spaces may represent the logarithms of any system whatever.

In 1619, Robert Napier, son of the inventor of logarithms, published a second edition of his father's *Logarithmorum Canonis Descriptio;* and, along with this, the promised *Logarithmorum Canonis Constructio*, and other pieces written by his father and Mr Briggs. An exact copy of the same two works in one volume was also printed in 1620 at Lyons in France. In 1618 or 1619, Benjamin Ursinus, mathematician to the elector of Brandenburg, published Napier's tables of logarithms in his *Cursus Mathematicus*, to which he added some tables of proportional parts; and in 1624 he printed his *Trigonometria*, with a table of natural sines, and their logarithms of the Napierian kind and form, to every ten seconds of the quadrant.

In the same year, 1624, the celebrated John Kepler published, at Marpurg, logarithms of nearly the same kind, under the title of *Chilias Logarithmorum ad totidem Numeros Rotundos, præmissa Demonstratione legitima Ortus Logarithmorum eorumque Usus*, &c.; and in the following year he published a supplement to this work. In the preface to this last he says, that several of the professors of mathematics in Upper Germany, and more especially those who were advanced in years, and grown averse to new methods of reasoning which carried them out of their old principles and habits, doubted whether Napier's demonstration of the property of logarithms was perfectly true, and whether the application of them to trigonometrical calculations might not be unsafe, and lead the calculator who should trust in them to erroneous results; and in either case, whether the doctrine were true or not, they scarcely considered Napier's demonstration of it as legitimate and satisfactory. This opinion induced Kepler to compose the above-mentioned work, in which the whole doctrine is treated in a manner strictly geometrical, and free from the considerations of motion to which those elderly Germans had objected.

On the publication of Napier's Logarithms, Mr Henry Briggs, some time professor of geometry in Gresham College, London, and afterwards Savilian professor of geometry at Oxford, applied himself with great earnestness to the study and improvement of them. From the particular view which Napier took of the subject, and the manner in which he conceived logarithms to be generated, it happened that in his system the logarithms of a series of numbers which increased in a decuple ratio (as 1, 10, 100, 1000, &c.) formed a decreasing arithmetical series, whose common difference was 2·3205851. But it occurred to Briggs that it would be better and more conformable to the received decimal notation, to adopt a system in which the logarithms of the terms of such a geometrical series should differ from each other by unity or 1. This idea Briggs communicated to the public in his lectures, and also to Napier himself. He even went twice to Edinburgh to converse with him on the subject; and, on his first visit, Napier said that he had also formerly thought of the same improvement, but that he chose to publish the logarithms he had previously calculated, till such time as his health and convenience would allow him to make others more commodious. And whereas, in the change which Briggs proposed, it was intended to make the logarithms of the sines to increase from 0 (the logarithm of radius) to infinity, whilst the sines themselves should decrease, it was suggested to him by Napier that it would be better to make them increase, so that 0, instead of being the logarithm of radius, should be the logarithm of 1, and that 100,000, &c. should be the logarithm of radius. This Briggs admitted would be an improvement; and having changed the numbers he had already calculated so as to make them suit Napier's modification of his plan, he returned with them next year to Edinburgh, and submitted them to his perusal.

It appears, therefore, that whether Napier or Briggs was the inventor of this improved system of logarithms which has since been universally adopted, Napier had suggested to begin with the low number 1, and to make the logarithms, or the artificial numbers, as he had always called them, to increase with the natural numbers, instead of decreasing; which, however, made no alteration in the figures, but only in their affections or signs, changing them from negative to positive.

On Briggs's return from Edinburgh, in 1617, he printed the first thousand logarithms to eight places of figures, besides the index, with the title of *Logarithmorum Chilias prima;* but these seem not to have been published till after the death of Napier, for in his preface he expresses a hope that the circumstances which led to a change in the system would be explained in Napier's posthumous work, about to appear. But although Napier had intimated in a note he had given in Wright's translation of the *Canon Mirificus*, as well as in his *Rabdologia*, printed in 1617, that he intended to alter the scale, yet he does not state that Briggs was the first to think of this improvement, or to publish it. And as nothing was said on this point in Napier's posthumous work published in 1619 by his son, Briggs took occasion, in his *Arithmetica Logarithmica*, to assert his claims to the improvement which he had carried into execution. But he has by no means proved that he himself, and not Napier, was the first who had thought of such improvements.

In 1620, Mr Edmund Gunter published his *Canon of Triangles*, which contains the artificial or logarithmic sines and tangents to every minute to seven places of figures besides the index, the logarithm of radius being 10. These logarithms are of the kind which had been agreed upon between Napier and Briggs, and they were the first tables of logarithmic sines and tangents that were published of this sort. Gunter also, in 1623, reprinted the same in his book *De Sectore et Radio*, together with the *Chilias prima* of Briggs; and in the same year he applied the logarithms of numbers, sines, and tangents, to straight lines drawn upon a ruler. This instrument is now in common use for navigation and other purposes, and is commonly called *Gunter's Scale.*

The discoveries in logarithms were carried to France by Mr Edmund Wingate, but not first of all, as he says in the preface to his book. He published at Paris in 1624 two small tracts in French upon logarithms, which were reprinted with improvements at London in 1626.

In the year 1624, Briggs published his *Arithmetica Logarithmica*, a stupendous work, considering the short time he had been in preparing it. He there gives the logarithms of 30,000 natural numbers to fourteen places of figures, besides the index; namely, from 1 to 20,000, and from 90,000 to 100,000, together with the differences of the logarithms. He also gives an ample treatise on their construction and use, and he earnestly solicits others to undertake the computation of the intermediate numbers, offering to give instructions, and paper ready ruled for that purpose, to any person inclined to contribute to the completion of so valuable a work. By this invitation, he had hopes of collecting materials for the logarithms of the intermediate 70,000 numbers, whilst he should employ his time upon the Canon of Logarithmic Sines and Tangents, and so carry on both works at once.

Soon after this, Adrian Vlacq or Flack of Gouda, in Holland, completed the intermediate 70 chiliads, and republished the *Arithmetica Logarithmica* in 1627 and 1628, with these intermediate numbers, making in all the logarithms of all numbers to 100,000, but only to 10 places of figures. To these was added a table of artificial sines, tangents, and secants, to every minute of the quadrant.

Briggs himself lived also to complete a table of logarithmic sines and tangents, to the 100th part of every degree to fourteen places of figures, besides the index, together with a table of natural sines to the same parts to fifteen places, and the tangents and secants of the same to ten places, with the construction of the whole. But death prevented him from completing the application and uses of them. However, when dying, he committed this to his friend Henry Gellibrand, who accordingly added a preface, and the application of the logarithms to plane and spherical trigonometry. The work was called *Trigonometria Britannica*, and was printed at Gouda in 1633, under the care of Adrian Vlacq, who in the same year printed his own *Trigonometria Artificialis, sive Magnus Canon Triangulorum Logarithmicus ad Decadas Secundorum Scrupulorum Constructus.* This contains the logarithmic sines and tangents to 10 places of figures, with their differences for every ten seconds in the quadrant. It also contains Briggs's table of the first 20,000 logarithms to ten places, besides the index, with their differences; and to the whole is prefixed a description of the tables and their applications, chiefly extracted from Briggs's *Trigonometria Britannica* just mentioned.

Gellibrand also published, in 1635, *An Institution Trigonometrical,* containing the logarithms of the first 10,000 numbers, with the natural sines, tangents, and secants, and the logarithmic sines and tangents, for degrees and minutes; all to seven decimal places.

The writers whose works we have hitherto noticed were for the most part computors of logarithms. But the system best adapted to practice being now well ascertained, and the labour of constructing the table accomplished, succeeding writers on the subject have had little more to do than to give the tables in the most convenient form. It is true, that in consequence of the numerous discoveries which were afterwards made in mathematics, particularly in the doctrine of series, great improvements were made in the method of computing logarithms; but these, for the most part, came too late to be of use in the actual construction of the tables, although they might be applied with advantage to verify calculations previously performed by methods much more laborious, and to detect various errors which had crept into the numbers.

As it is of importance that such as have occasion to employ logarithms should know what works are esteemed for their extent and accuracy, we shall mention the following:

Sherwin's *Mathematical Tables,* in 8vo. These contain the logarithms of all numbers to 101,000; and the sines, tangents, secants, and versed sines, both natural and logarithmic, to every minute of the quadrant. The third edition, printed in 1742, which was revised by Gardiner, is esteemed the most correct; but, in the fifth edition, the errors are so numerous, that no dependence can be placed on it.

Gardiner's Tables of Logarithms for all numbers to 101,000, and for the sines and tangents to every ten seconds of the quadrant; also for the sines of the first 72 minutes to every single second, &c. This work, which is in quarto, was printed in 1742, and is held in high estimation for its accuracy. An edition of the same work, with some additions, was printed in 1770, at Avignon, in France; and another by Callet at Paris in 1783, with farther improvements. The tables in both are to seven places of figures.

Hutton's *Mathematical Tables,* containing common, hyperbolic, and logistic logarithms, &c. and much valuable information respecting the history of logarithms, and other branches of mathematics connected with them.

Taylor's *Table of Logarithmic Sines and Tangents to every second of the quadrant;* to which is prefixed an able introduction by Dr Maskelyne, and a table of logarithms from 1 to 100,000, &c. This is a most valuable work; but being a large quarto volume, and rather expensive, it is less accessible than the preceding, which is an octavo, at a moderate price.

Tables portatives des Logarithmes, contenant les Logarithmes des nombres depuis 1 *jusqu'à* 108,000; *les logarithmes des sinus et tangentes, de seconde en seconde pour les cinq premiers degrés, de dix en dix secondes pour tous les degrés du quart de cercle, et suivant la nouvelle division centésimale de dix-millième en dix millième,* &c. par Callet. This work is in octavo, and printed in stereotype by Didot.

There are various smaller sets of tables; but probably the most accurate of all are those which Professor Babbage has produced with his very ingenious calculating machine, which has enabled him to detect a variety of errors in former tables. But, what is rather amusing, on examining a set of tables printed in the Chinese character, and which, like every Chinese invention, were older than the deluge, Mr Babbage found they contained precisely the same errors as those of Vlacq did; thus proving, as had long been suspected, from what source those original inventors had derived their logarithms.

In addition to these, it is proper that we should notice a stupendous work relating to logarithms, originally suggested by the celebrated Carnot, in conjunction with Prieur de la Côte d'Or, and Brunet de Montpellier, about the beginning of the French revolution. This enterprise was committed in 1794 to the care of Baron de Prony, a mathematician of great eminence, who was *not only to compose tables which should leave nothing to be desired with respect to accuracy, but to make them the most extended and most striking monument of calculation ever executed or imagined.* Two manuscript copies of the work, composed of seventeen volumes large folio, contained, besides an introduction,

1. The natural sines for each 10,000th part of the quadrant, calculated to twenty-five places of decimals, to be published with twenty-two decimals and five columns of differences.
2. The logarithms of these sines, calculated to fourteen decimals, with five columns of differences.
3. The logarithms of the ratios of the sines to the arcs for the first five thousand 100,000th parts of the quadrant, calculated to fourteen decimal places, with three columns of differences.
4. The logarithms of the tangents corresponding with the logarithms of the sines.
5. The logarithms of the ratios of the tangents to the arcs, calculated like those of the third article.
6. Logarithms of numbers from 1 to 100,000, calculated to nineteen places of decimals.
7. The logarithms of numbers from 100,000 to 200,000, calculated to twenty-four decimals, in order to be published to twelve decimals and three columns of differences.

The printing of this work, though begun by the French government, was afterwards suspended.

II.—NATURE OF LOGARITHMS, AND THEIR CONSTRUCTION.

We have already shown that the properties of logarithms are deducible from those of two series, the terms of one of which form a geometrical progression, and those of the other an arithmetical progression; and as this manner of treating the subject is simple, it is perhaps the best adapted of any to such of our readers as have not pursued the study of mathematics to any great extent. We shall now show how, from the same principles, the logarithm of any proposed number may be found, as was done by the earlier computers, though it is far from affording the easiest mode of forming a table.

The first step to be taken in constructing a system of logarithms is to assume the logarithm of some determinate number, besides that of unity or 1, which must necessarily be 0. From the particular view which Napier first took of the subject, he was led to assume unity for the logarithm of the number 2·718282, by which it happened that the logarithm of 10 was 2·302585; and this assumption being made, the form of the system became determinate, and the logarithm of every number fixed to one particular value.

It was, however, soon observed, that it would be better to assume unity for the logarithm of 10, instead of making it the logarithm of 2·718282, as in Napier's first system; and hence the logarithms of the terms of the geometrical progression

$$1, \quad 10, \quad 100, \quad 1000, \quad 10{,}000, \ \&c.$$

were necessarily fixed to the corresponding terms of this arithmetical progression,

$$0, \quad 1, \quad 2, \quad 3, \quad 4, \ \&c.$$

That is, the logarithm of 1 being 0, and that of 10 being 1, the logarithm of 100 is 2, that of 1000 is 3, and so on.

The logarithms of the terms of the progression 1, 10, 100, 1000, &c. being thus determined; in order to form the logarithms of the numbers between 1 and 10, and between 10 and 100, and so on, we must conceive a very great number of geometrical means to be interposed between each two adjoining terms of the preceding geometrical series, and as many arithmetical means between the corresponding terms of the arithmetical series; then, like as the terms of the arithmetical series 0, 1, 2, 3, &c. are the logarithms of the corresponding terms of the geometrical series 1, 10, 100, 1000, &c. the interpolated terms of the former will also be the logarithms of the corresponding interpolated terms of the latter. Now, by supposing the number of means interposed between each two terms of the geometrical series to be sufficiently great, some one or other of them may be found which will be very nearly equal to any proposed number. Hence, to find the logarithm of such a number, we have only to seek for one of the interpolated means which is very nearly equal to it, and to take the logarithm of that mean as a near value of the logarithm required.

As a particular example, let it be required to find the logarithm of 5, according to Briggs's system.

First step of the process.—The number 5 is between 1 and 10, the logarithms of which we already know to be 0 and 1: Let a geometrical mean be found between the two former, and an arithmetical mean between the two latter. The geometrical mean will be the square root of the product of the numbers 1 and 10, which is 3·162277; and the arithmetical mean will be half the sum of the logarithms 0 and 1, which is 0·5; therefore the logarithm of 3·162277 is 0·5. But as the mean thus found is not sufficiently near the proposed number, we must proceed with the operation as follows:

Second step.—The number 5, whose logarithm is sought, is between 3·162277, the mean last found, and 10, the logarithms of which we know to be 0·5 and 1; we must now find a geometrical mean between the two former, and an arithmetical mean between the two latter. The one of these is $\sqrt{(3{\cdot}162277 \times 10)} = 5{\cdot}623413$, and the other is $\frac{1 + 0{\cdot}5}{2} = 0{\cdot}75$, the logarithm of 5·623413.

Third step.—We have now obtained two numbers, namely, 3·162277 and 5·623413, one on each side of 5, together with their logarithms 0·5 and 0·75; we therefore, proceeding as before, find the geometrical mean, or $\sqrt{(3{\cdot}162277 \times 5{\cdot}623413)}$, to be 4·216964, and the arithmetical mean $\frac{0{\cdot}5 + 0{\cdot}75}{2} = 0{\cdot}625$, the logarithm of 4·216964.

Fourth step.—We proceed in the same manner with the numbers 4·216964, and 5·623413 (one of which is less and the other greater than 5), and their logarithms 0·625 and 0·75, and find a new geometrical mean, viz. 4·869674, and the corresponding arithmetical mean or logarithm 0·6875.

We must go on in this way till we have found twenty-two geometrical means, and as many corresponding arithmetical means or logarithms. And that we may indicate how these are found from each other, let the numbers 1 and 10 be denoted by A and B, and their geometrical means taken in their order by C, D, E, &c. then the results of the successive operations will be as in the following table:

	Numbers.	Logarithms.
A =	1·000000	0·0000000
B =	10·000000	1·0000000
C = $\sqrt{AB}$ =	3·162277	0·5000000
D = $\sqrt{BC}$ =	5·623413	0·7500000
E = $\sqrt{CD}$ =	4·216964	0·6250000
F = $\sqrt{DE}$ =	4·869674	0·6875000
G = $\sqrt{DF}$ =	5·232991	0·7187500
H = $\sqrt{FG}$ =	5·048065	0·7031250
I = $\sqrt{FH}$ =	4·958069	0·6953125
K = $\sqrt{HI}$ =	5·002865	0·6992187
L = $\sqrt{IK}$ =	4·980416	0·6972656
M = $\sqrt{KL}$ =	4·991627	0·6982421
N = $\sqrt{KM}$ =	4·997242	0·6987304
O = $\sqrt{KN}$ =	5·000052	0·6989745
P = $\sqrt{NO}$ =	4·998647	0·6988525
Q = $\sqrt{OP}$ =	4·999350	0·6989135
R = $\sqrt{OQ}$ =	4·999701	0·6989440
S = $\sqrt{OR}$ =	4·999876	0·6989592
T = $\sqrt{OS}$ =	4·999963	0·6989668
V = $\sqrt{OT}$ =	5·000008	0·6989707
W = $\sqrt{TV}$ =	4·999984	0·6989687
X = $\sqrt{WV}$ =	4·999997	0·6989697
Y = $\sqrt{VX}$ =	5·000003	0·6989702
Z = $\sqrt{XY}$ =	5·000000	0·6989700

As the last of these means, viz. Z, agrees with 5, the proposed number, as far at least as the sixth place of decimals, we may safely consider them as very nearly equal, and therefore their logarithms very nearly equal; that is, the logarithm of 5 will be 0·6989700 nearly.

In performing the operations indicated in the preceding table, it is necessary to find the geometrical means at the beginning to many more figures than are here put down, in order to insure at last a result true to 7 decimal places. Thus it appears that the labour of computing logarithms by this method is indeed very great. It is, however, that which was employed by Briggs and Vlacq in the original construction of logarithms; but since their time more easy methods have been found, some of which we shall presently have occasion to explain; and a still easier method by Sir John Leslie will be found at the end of this article.

The logarithm of any number whatever may be found by a series of calculations similar to that just explained. But in constructing the table it would only be necessary to have recourse to this method in calculating the logarithms of prime numbers; for as often as the logarithm of a number which was the product of other numbers, whose logarithms were known, was required, it would be immediately obtained by adding together the logarithms of its factors. On the contrary, if the logarithm of the product of two numbers were known, and also that of one of its factors, the logarithm of the other factor would be obtained from these, by simply taking their difference.

From this last remark it is obvious, that having now found the logarithm of 5, we can immediately find that of 2; for since 2 is the quotient of 10 divided by 5, its logarithm will be the difference of the logarithms of 10 and 5; now the logarithm of 10 is 1, and that of 5 is 0·6989700, therefore the logarithm of 2 is 0·3010300.

Having thus obtained the logarithms of 2 and 5, in addition to those of 10, 100, 1000, &c. we may thence find the logarithms of innumerable other numbers. Thus, because $4 = 2 \times 2$, the logarithm of 4 will be the logarithm of 2 added to itself, or will be twice the logarithm of 2. Again, because $5 \times 10 = 50$, the logarithm of 50 will be the sum of the logarithms of 5 and 10. In this manner it is evident we may find the logarithms of $8 = 2 \times 4$, of $16 = 2 \times 8$, of $25 = 5 \times 5$, and of as many more such numbers as we please.

Besides the view we have hitherto taken of the theory of logarithms, there are others under which it has been presented by different authors. Some of these we proceed to explain, beginning with that in which they are defined to be the *measures of ratios;* but to see the propriety of this definition, it must be understood what is meant by the measure of a ratio.

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According to the usual definition of a compound ratio, if there be any number of magnitudes A, B, C, D, in continued proportion, the ratio of the first, A, to the third, C, is considered as made up of two ratios, each equal the ratio of the first, A, to the second, B. And in like manner the ratio of the first, A, to the fourth, D, is considered as made of three ratios, each equal the same ratio of the first to the second, and so on. Thus, to take a particular example in numbers, because the ratio of 81 to 3 may be considered as made up of the ratio of 81 to 27, and of 27 to 9, and of 9 to 3, which three ratios are equal among themselves, the ratio of 81 to 3 will be triple that of 9 to 3; and in like manner the ratio of 27 to 3 will be double that of 9 to 3. Also, because the ratios of 1000 to 100, 100 to 10, 10 to 1, are all equal, the ratio of 1000 to 1 will be three times as great as that of 10 to 1; and the ratio of 100 to 1 will be twice as great; and so on.

Taking this view of ratios, and considering them as a particular species of quantities, made up of others of the same kind, they may evidently be compared with each other in the same manner as we compare lines or quantities of any kind whatever. And as, when estimating the relative magnitude of two quantities, two lines, for example, if the one contains five such equal parts as the other contains seven, we say the one line has to the other the proportion of 5 to 7; so, in like manner, if two ratios be such, that the one can be resolved into five equal ratios, and the other into seven of the same ratios, we may conclude that the magnitude of the one ratio is to that of the other as the number 5 to the number 7; and a similar conclusion may be drawn, when the ratios to be compared are any multiples whatever of some other ratio.

Since lines and other quantities, which admit of no common measure, are said to be incommensurable to each other, the same will obviously happen to ratios; that is, there may be two ratios such, that into whatever number of equal ratios the one is divided, the other cannot possibly be exactly equal to a ratio composed of any integral number of these. We may, however, conceive the number of equal ratios into which the one is divided to be so great, that a certain number of them shall compose a ratio more nearly equal to the other ratio than by any assignable difference. Therefore, like as we can always find numbers which shall have among themselves, either accurately, or as nearly as we please, the same ratios as lines or other magnitudes have to each other, and which therefore may be taken as the measures or representatives of the lines; so also, corresponding to any system of ratios, there may be always found a series of numbers which will have the same proportions among themselves as the ratios have to each other, and which may in like manner be called the *measures of the ratios.*

Let us now suppose that unity, or 1, is assumed as the common consequent or second term of all ratios whatever; and that the ratio of 10 (or some particular number) to 1 is compounded of a very great number of equal ratios, as, for example, 1,000,000: then, as each of these will be very near the ratio of equality (for it will be the ratio of the first term to the second of a series consisting of one million and one continued proportionals, the first of which is 10 and last 1), it will follow, and is easy to conceive, that the ratios of all other numbers to unity will each be very nearly equal to some multiple of that small ratio. And by supposing the number of small equal ratios of which the ratio of 10 to 1 is composed, to be sufficiently great, the ratios of all other numbers to unity may be as nearly equal to ratios which are multiples of that small ratio, as we please. Let us still suppose, however, for the sake of illustration, that the number of small ratios contained in that of 10 to 1 is 1,000,000; then, as it may be proved that the ratio of 2 to 1 will be very nearly the same as a ratio composed of 301,030 of these, and that the ratio of 3 to 1 will be nearly equal to a ratio composed of 477,121 of them, and that the ratio of 4 to 1 will be nearly equal to a ratio composed of 602,060 of them, and so on; these numbers, viz. 1,000,000, 301,030, 477,121, and 602,060, or any other numbers proportional to them, will be the *measures* of the ratios of 10 to 1, 2 to 1, 3 to 1, and 4 to 1, respectively; and the same quantities will also be what have been called the *logarithms* of the ratios; for the word *logarithm*, if regard be had to its etymology, is λογῶν ἀριθμοὶ, or the numbers of small and equal ratios (or *ratiunculæ*, as they have been called) contained in the several ratios of quantities one to another.

We have, for the sake of illustration, assumed 1,000,000 as the measure of the ratio of 10 to 1, by which it happens, as already observed, that the measures of the ratios of 2 to 1, 3 to 1, &c. are 301,030 and 477,121 respectively; as, however, these measures are not absolute, but relative quantities, we may assume any other numbers whatever instead of these, provided they are proportional to them. Accordingly, we may assume 1 as the measure or logarithm of the ratio of 10 to 1; and then the logarithms of the ratios of 2 to 1, 3 to 1, &c. instead of being 301,030, 477,121, &c. will be ·301030 and ·477121, &c. respectively, that is, each will be one millionth of what it was before.

In Briggs's system, the logarithm of the ratio of 10 to 1, or, to speak briefly, the logarithm of 10, is unity; but we are at liberty to assume any number whatever, as that whose logarithm shall be unity. Napier, in consequence of his particular views, chose 2,718,282; and hence it happens that the logarithms of the ratios are expressed by different numbers in the two systems.

But, to show the identity of the properties of logarithms, as explained in the two different views now given of the subject, let A and B denote any two numbers. The ratio of their product to unity, that is, the ratio of $A \times B$ to 1, is compounded of the ratio of A to 1 and of B to 1; and consequently the logarithm of the ratio of $A \times B$ to 1 will equal the sum of the logarithms of the ratios of A to 1, and of B to 1; or, in other words, the logarithm of $A \times B$ will be the sum of the logarithms of A and B. Now, $\log. (A \times B) = \log. A + \log. B$, therefore, $\log. B = \log. (A \times B) - \log. A$. Let $\frac{C}{D}$ be substituted for B, and D for A, then (because $A \times B = D \times \frac{C}{D} = C$) we have $\log. \frac{C}{D} = \log. C - \log. D$.

Such is a short sketch of the theory of logarithms as deducible from the doctrine of ratios. It was in this way that the celebrated Kepler treated the subject; and he has been followed by Mercator, Halley, and Cotes, as well as by mathematicians of later times, as by Baron Maseres in his Trigonometry. The same mode was likewise adopted in the posthumous works of Dr Robert Simson. As, however, the doctrine of ratios is very abstract, and the mode of reasoning upon which it has been established is of a peculiar and subtile kind, we presume that the greater number of readers will think this view of the subject less simple and natural than the following, in which we mean to deduce the theory of logarithms, as well as the manner of computing them, from the properties of the exponents of powers.

The common scale of notation in arithmetic is so contrived as to express all numbers whatever by the powers of 10, which is the root of the scale, and the nine digits serving as co-efficients to these powers. Thus, if R denote 10, the root of the scale, so that R^2 will denote 100, and R^3 1000, and so on, the number 471,509 is otherwise expressed by $4R^5 + 7R^4 + 1R^3 + 5R^2 + 0R^1 + 9R^0$, which is

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equivalent to $4R^5 + 7R^4 + R^3 + 5R^2 + 9$. Again, the mixed number 371·243 is expressed by $3R^2 + 7R^1 + R^0 + \frac{2}{R} + \frac{4}{R^2} + \frac{3}{R^3}$, or by $3R^2 + 7R^1 + R^0 + 2R^{-1} + 4R^{-2} + 3R^{-3}$. As to vulgar fractions, by transforming them to decimals, they may be expressed in the same manner. Thus $\frac{3}{8} = {\cdot}375 = 3R^{-1} + 7R^{-2} + 5R^{-3}$. Also $\frac{2}{3} = {\cdot}666$, &c. $= 6R^{-1} + 6R^{-2} + 6R^{-3} +$ &c.

But instead of expressing all numbers by the sums of certain multiples of the successive powers of some particular number, we may also express them, if not accurately, at least as near as we please, by a single power, whole or fractional, of any positive number whatever, which may be either whole or fractional, but must not be unity.

Let us take, for example, 2 as the number, by the powers of which all others are to be expressed. Then it may be shown that the numbers 1, 2, 3, &c. are all expressible by the powers of 2, as follows.

$$\begin{array}{ll}
1 = 2^0 & 6 = 2^{2.58496} \text{ nearly} \\
2 = 2^1 & 7 = 2^{2.8073} \text{ nearly} \\
3 = 2^{1.58496} \text{ nearly} & 8 = 2^3 \\
4 = 2^2 & 9 = 2^{3.1699} \text{ nearly} \\
5 = 2^{2.3219} \text{ nearly} & 10 = 2^{3.3219} \text{ nearly}
\end{array}$$

and so on. And if instead of 2 we take the number 10, then we have

$$\begin{array}{ll}
1 = 10^0 & 6 = 10^{\cdot 77815} \\
2 = 10^{\cdot 30103} & 7 = 10^{\cdot 84510} \\
3 = 10^{\cdot 47712} & 8 = 10^{\cdot 90309} \\
4 = 10^{\cdot 60206} & 9 = 10^{\cdot 95424} \\
5 = 10^{\cdot 69897} & 10 = 10^1.
\end{array}$$

Hence we may conclude, that if r be put for some determinate number, and n for any indefinite positive number, whole or fractional, it is always possible to find another number N, such that r being raised to the power N, shall either be exactly equal to n, or as near it as we please; that is, we shall have $r^N = n$.

When numbers are expressed in this way by the powers of some given number r, *the exponent of that power of r which is equal to any assigned number is called the logarithm of that number.* Thus, if $r^N = n$ (n being put for any number), N is the logarithm of n.

The logarithms which are produced by giving to r some determinate value, constitute a *system* of logarithms; and the constant number r, from which the system is formed, is called the *base, radix,* or radical number of the system.

The properties of logarithms may readily be deduced from the above definition as follows: Let a and b be any two numbers, and A and B their logarithms; then r being supposed to denote the base or radical number of the system, we have $a = r^A$ and $b = r^B$: now if we take the product of a and b, we have $ab = r^A \times r^B = r^{A+B}$; but, according to the definition, A + B is the logarithm of ab (for it is the index of that power of r which is equal to ab), therefore *the sum of the logarithms of any two numbers a and b is the logarithm of their product ab.* Again, we have $\frac{a}{b} = \frac{r^A}{r^B} = r^{A-B}$, but here A — B, being the index of that power of r which is equal to $\frac{a}{b}$, is the logarithm of $\frac{a}{b}$; hence, *if one number a be divided by another b, the difference between their logarithms is the logarithm of the quotient* $\frac{a}{b}$.

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Let n express any number whatever, then raising both sides of the equation $a = r^A$ to the nth power, we have $a^n = (r^A)^n = r^{nA}$; but here nA is manifestly the logarithm of a^n; therefore, *the logarithm of a^n, any power of a number, is the product of the logarithm of the number by n, the index of the power. This must evidently be true, whether n be a whole number or a fraction, positive or negative.*

From these properties, it is easy to see in what manner a table exhibiting the logarithms of all numbers within certain limits may be applied to simplify calculations; for since the sum of the logarithms of any two numbers is the logarithm of their product, it follows, that as often as we have occasion to find the product of two or more numbers, we have only to add their logarithms taken from the table into one sum, and to look for the number whose logarithm is equal to that sum, and this number will be the product required. Also, because the difference between the logarithm of the dividend and that of the divisor is the logarithm of the quotient, whenever we have occasion to divide one number by another, we have only to subtract the logarithm of the divisor from that of the dividend, and opposite to that logarithm in the table, which is the remainder, we find the quotient.

As the logarithm of any power of a number is the product of the logarithm of the number by the index of the power; and, on the contrary, the logarithm of any root of a number is the quotient found by dividing the logarithm of the number by the index of the root; it follows that we may find any power or root of a number by multiplying the logarithm of the number by the index of the power, or dividing it by the index of the root, and taking that number in the table whose logarithm is the product or quotient for the power or root required.

If in the equation $a = r^A$ (where a is any number, A its logarithm, and r the base of the system) we suppose $a = 1$, then $r^A = 1$; but this equation can only be satisfied by $A = 0$. Hence it appears, *that in every system of logarithms, the logarithm of unity must be* 0. If, on the other hand, we assume $a = r$, then we have the equation $r = r^A$, which is immediately satisfied by putting $A = 1$; therefore, *the logarithm of the base, or radical number of every system, is necessarily unity.*

If we suppose r and a to be each a positive number greater than unity, then A will be a positive number; for if it be a negative we would have $a\left(= r^{-A} = \frac{1}{r^A}\right)$, a proper fraction, and at same time a number greater by hypothesis than unity, which is absurd. If, on the contrary, we suppose a a proper fraction, then A must necessarily be negative, otherwise r^A would be greater than unity, and $a\,(= r^A)$ also greater than unity, while by hypothesis it is a fraction less than unity, which is absurd. *Therefore, in every system, the base of which exceeds unity, the logarithm of a whole or mixed number is always positive, but the logarithm of a proper fraction is always negative.*

Because the logarithm of r is unity, that of r^n will be n; therefore, *the logarithm of any integral power of the radical number r will always be an integer.*

Let r and r' denote bases of two different systems; and let A be the logarithm of a number, a, taken according to the first of these, and A′ its logarithm according to the second. Then, because $a = r^A$, and $a = r'^{A'}$, it follows that $r^A = r'^{A'}$, and $r = r'^{\frac{A'}{A}}$. Let us now suppose that r'' is the base of a third system of logarithms, and R and R′, Nature of Logarithms.

the logarithms of r and r', taken according to this third system; then, because

$$r''^{\mathrm{R}} = r, \qquad r''^{\mathrm{R}'} = r';$$

we have $r''^{\mathrm{RR}'} = r^{\mathrm{R}'}$, $r''^{\mathrm{RR}'} = r'^{\mathrm{R}}$;

therefore $r^{\mathrm{R}'} = r'^{\mathrm{R}}$, and $r = r'^{\frac{\mathrm{R}}{\mathrm{R}'}}$; but we have already found $r = r'^{\frac{\mathrm{A}'}{\mathrm{A}}}$, therefore $r'^{\frac{\mathrm{A}'}{\mathrm{A}}} = r'^{\frac{\mathrm{R}}{\mathrm{R}'}}$, and consequently

$$\frac{\mathrm{A}'}{\mathrm{A}} = \frac{\mathrm{R}}{\mathrm{R}'}, \text{ and } \mathrm{A} : \mathrm{A}' (: : \mathrm{R}' : \mathrm{R}) : : \frac{1}{\mathrm{R}} = \frac{1}{\mathrm{R}'}.$$

Hence it appears, *that the logarithm of a number, taken according to one system, has to its logarithm, taken according to any other system, a constant ratio, which is the same as that of the reciprocals of the logarithms of the radical numbers of those systems.*

Let us next suppose that a and b are two numbers, and A and B their logarithms, taken according to the same system, and r the base of the system; then, because

$$r^{\mathrm{A}} = a, \qquad r^{\mathrm{B}} = b;$$

we have $r^{\mathrm{AB}} = a^{\mathrm{B}}$, $r^{\mathrm{AB}} = b^{\mathrm{A}}$;

therefore $a^{\mathrm{B}} = b^{\mathrm{A}}$, and $a = b^{\frac{\mathrm{A}}{\mathrm{B}}}$. Now as r is not found in this equation, the value of the fraction $\frac{\mathrm{A}}{\mathrm{B}}$ depends only on a and b; therefore, *the logarithms of any two given numbers have the same ratio to each other in every system.*

Having now explained the properties which belong to the logarithms of any system, we proceed to investigate general rules by which the number corresponding to any logarithm, and, on the contrary, the logarithm corresponding to any number, may be found the one from the other. And for this end let us denote any number whatever by y, and its logarithm by x, and put r as before for the base or radical number of the system; then, by the nature of logarithms,

$$y = r^x.$$

Put $r = 1 + a$, and let the expression $(1 + a)^x$ be expanded into a series by the binomial theorem; thus

$$y = 1 + x\,a + \frac{x\,(x-1)}{1\cdot 2}a^2 + \frac{x\,(x-1)\,(x-2)}{1\cdot 2\cdot 3} + \frac{x\,(x-1)\,(x-2)\,(x-3)}{1\cdot 2\cdot 3\cdot 4}a^4 + \&\text{c.}$$

Let this series, the terms of which are arranged according to the powers of a, be transformed into another, whose terms shall be arranged according to the powers of x; and to effect this we must find the actual products of the factors which constitute the powers of a, and arrange the terms anew, as follows:

$$\begin{aligned}
1 &= 1,\\
x\,a &= +\,a\,x,\\
\frac{x\,(x-1)}{1\cdot 2}\,a^2 &= -\frac{a^2}{2}x + \frac{a^2}{2}x^2,\\
\frac{x\,(x-1)\,(x-2)}{1\cdot 2\cdot 3}\,a^3 &= +\frac{a^3}{3}x - \frac{a^3}{2}x^3 + \frac{a^3}{6}x^3,\\
\frac{x(x-1)(x-2)(x-3)}{1\cdot 2\cdot 3\cdot 4}\,a^4 &= -\frac{a^4}{4}x + \frac{11\,a^4}{24}x^2 - \frac{a^4}{4} + x^3\frac{a^4}{24}x^4,\\
\&\text{c.} \qquad & \qquad \&\text{c.}
\end{aligned}$$

so that adding into one sum the quantities on each side of the sign $=$, and recollecting that the sum of those on the left-hand side is equal to y, we have

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$$y = r^x = \begin{cases}
1\\
+\,(a - \frac{a^2}{2} + \frac{a^3}{3} - \frac{a^4}{4} + \&\text{c.})\,x\\
+\,(\frac{a^2}{2} - \frac{a^3}{2} + \frac{11\,a^4}{24} - \&\text{c.})\,x^2\\
+\,(\frac{a^3}{6} - \frac{a^4}{4} + \&\text{c.})\,x^3\\
+\,(\frac{a^4}{24} - \&\text{c.})\,x^4\\
+\,\&\text{c.}
\end{cases}$$

$$\begin{aligned}
\text{Put } \mathrm{A} &= a - \frac{a^2}{2} + \frac{a^3}{3} - \frac{a^4}{4} + \&\text{c.}\\
\mathrm{A}' &= \frac{a^2}{2} - \frac{a^3}{2} + \frac{11\,a^4}{24} - \&\text{c.}\\
\mathrm{A}'' &= \frac{a^3}{6} - \frac{a^4}{4} + \&\text{c.}\\
\mathrm{A}''' &= \frac{a^4}{24} - \&\text{c.}\\
\&\text{c.}
\end{aligned}$$

then $r^x = 1 + \mathrm{A}x + \mathrm{A}'x^2 + \mathrm{A}''x^3 + \mathrm{A}'''x^4 + \&\text{c.}$

Next, to determine the law of connection of the quantities A, A′, A″, A‴, &c. since the last equation is to hold good whatever be the value of the variable quantity, a similar equation may be formed with the same co-efficients, and having $x + z$ for its variable (z being any indefinite quantity); thus we have also

$$r^{x+z} = 1 + \mathrm{A}(x+z) + \mathrm{A}'(x+z)^2 + \mathrm{A}''(x+z)^3 + \&\text{c.}$$

But $r^{x+z} = r^x \times r^z$, and since it has been shown that

$$r^x = 1 + \mathrm{A}x + \mathrm{A}'x^2 + \mathrm{A}''x^3 + \mathrm{A}'''x^4 + \&\text{c.}$$

for the same reason

$$r^z = 1 + \mathrm{A}z + \mathrm{A}'z^2 + \mathrm{A}''z^3 + \mathrm{A}'''z^4 + \&\text{c.}$$

therefore the series

$$1 + \mathrm{A}(x+z) + \mathrm{A}'(x+z)^2 + \mathrm{A}''(x+z)^3 + \mathrm{A}'''(x+z)^4 + \&\text{c.}$$

is equal to the product of the two series

$$1 + \mathrm{A}x + \mathrm{A}'x^2 + \mathrm{A}''x^3 + \mathrm{A}'''x^4 + \&\text{c.}$$
$$1 + \mathrm{A}z + \mathrm{A}'z^2 + \mathrm{A}''z^3 + \mathrm{A}'''z^4 + \&\text{c.}$$

That is, by the actual involution of the former and multiplication of the two latter,

$$\left.\begin{array}{l}
1 + \mathrm{A}x + \mathrm{A}'x^2 + \mathrm{A}''x^3 + \mathrm{A}'''x^4 + \&\text{c.}\\
+ \mathrm{A}z + 2\mathrm{A}'xz + 3\mathrm{A}''x^2z + 4\mathrm{A}'''x^3z + \&\text{c.}\\
\qquad + \mathrm{A}'z^2 + 3\mathrm{A}''xz^2 + 6\mathrm{A}'''x^2z^2 + \&\text{c.}\\
\qquad\qquad + \mathrm{A}''z^3 + 4\mathrm{A}'''xz^3 + \&\text{c.}\\
\qquad\qquad\qquad + \mathrm{A}'''z^4 + \&\text{c.}
\end{array}\right\} =$$

$$= \begin{cases}
1 + \mathrm{A}x + \mathrm{A}'x^2 + \mathrm{A}''x^3 + \mathrm{A}'''x^4 + \&\text{c.}\\
\quad + \mathrm{A}z + \mathrm{A}^2xz + \mathrm{A}\mathrm{A}'x^2z + \mathrm{A}\mathrm{A}''x^3z + \&\text{c.}\\
\qquad + \mathrm{A}'z^2 + \mathrm{A}\mathrm{A}'xz^2 + \mathrm{A}'\mathrm{A}'x^2z^2 + \&\text{c.}\\
\qquad\qquad + \mathrm{A}''z^3 + \mathrm{A}\mathrm{A}''xz^3 + \&\text{c.}\\
\qquad\qquad\qquad + \mathrm{A}'''z^4 + \&\text{c.}
\end{cases}$$

Now the quantities A, A′, A″, &c. being quite independent of x and z, the two sides of the equation can only be identical, upon the supposition that the co-efficients of like terms in each are equal; therefore, setting aside the first line of each side of the equation, because their terms are the same, and also the first term of the second line, for the same reason, let the co-efficients of the remaining terms be put equal to one another. Thus we have

$$\left.\begin{array}{r}
\mathrm{A}^2 = 2\mathrm{A}'\\
\mathrm{A}\mathrm{A}' = 3\mathrm{A}''\\
\mathrm{A}\mathrm{A}'' = 4\mathrm{A}'''\\
\&\text{c.}
\end{array}\right\} \text{ and hence we have } \left\{\begin{array}{l}
\mathrm{A}' = \frac{\mathrm{A}^2}{1\cdot 2}\\
\mathrm{A}'' = \frac{\mathrm{A}^3}{1\cdot 2\cdot 3}\\
\mathrm{A}''' = \frac{\mathrm{A}^4}{1\cdot 2\cdot 3\cdot 4}\\
\&\text{c.}
\end{array}\right.$$

Here the law of the co-efficients A, A′, A″, &c. is obvious, each being formed from the preceding by multiplying it by A, and dividing by the exponent of the power of A, which is thus formed. Let these values of A′, A″, &c. be now substituted in the equation

$$y=r^x=1+Ax+A'x^2+A''x^3+\&c.$$

and it becomes

$$y=1+Ax+\frac{A^2}{1\cdot 2}x^2+\frac{A^3}{1\cdot 2\cdot 3}x^3+\frac{A^4}{1\cdot 2\cdot 3\cdot 4}x^4+\&c.$$

Thus we have obtained a general formula expressing a number in terms of its logarithm and the base of the system, for we must recollect that since $a=r-1$, the quantity A, which is equal to

$$a-\frac{a^2}{2}+\frac{a^3}{3}-\frac{a^4}{4}+\frac{a^5}{5}-\&c.$$

is otherwise expressed by

$$r-1-\frac{(r-1)^2}{2}+\frac{(r-1)^3}{3}-\frac{(r-1)^4}{4}+\frac{(r-1)^5}{5}-\&c.$$

where r denotes the base of the system.

If in the formula

$$r^x=1+Ax+\frac{A^2}{1\cdot 2}x^2+\frac{A^3}{1\cdot 2\cdot 3}x^3+\frac{A^4}{1\cdot 2\cdot 3\cdot 4}x^4+\&c.$$

we suppose $x=1$, it becomes

$$r=1+A+\frac{A^2}{1\cdot 2}+\frac{A^3}{1\cdot 2\cdot 3}+\frac{A^4}{1\cdot 2\cdot 3\cdot 4}+\&c.$$

an equation which contains r only; but as r has been all along supposed an indeterminate quantity, this equation must be identical, that is, if, instead of A, its value, as expressed above in terms of r, were substituted, the equation would become $r=r$.

Again, let us suppose that $\frac{1}{A}$ is substituted instead of x in the general formula; thus it becomes

$$r^{\frac{1}{A}}=1+1+\frac{1}{1\cdot 2}+\frac{1}{1\cdot 2\cdot 3}+\frac{1}{1\cdot 2\cdot 3\cdot 4}+\&c.$$

Thus the quantity $r^{\frac{1}{A}}$, whatever be the value of r, is evidently equal to a constant number, which, as appears from the last equation, is equal to the value of r when $A=1$. By adding together a sufficient number of terms of the last series, we find it nearly equal to

2·7182818284590452353602874.

If this be denoted by e, we have $r^{\frac{1}{A}}=e$, and $r=e^A$; hence, if the number e be considered as the base of a logarithmic system, the quantity A, namely,

$$r-1-\frac{(r-1)^2}{2}+\frac{(r-1)^3}{3}-\frac{(r-1)^4}{4}+\frac{(r-1)^5}{5}-\&c.$$

is the logarithm of r to the base e. But as r is not restricted here to any particular value, we may substitute y instead of it, keeping in mind that y denotes any number whatever, and x its logarithm; thus we have x the logarithm of y, expressed by the series

$$y-1-\frac{(y-1)^2}{2}+\frac{(y-1)^3}{3}-\frac{(y-1)^4}{4}+\frac{(y-1)^5}{5}-\&c.$$

supposing that the base of the system is the number we have expressed above by e.

We have now found a general formula for the logarithm of any number y, taken according to a particular system, namely, that which has the number e for its base. But it is easy from hence to find a formula, which shall apply to any system whatever. For it has been shown that the logarithms of the same number, taken according to two different systems, are to each other as the reciprocals of the logarithms of the bases of the systems, these last logarithms being taken according to any system whatever, that is,

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$$\log. y \text{ to base } e : \log. y \text{ to base } r :: \frac{1}{\log. e} : \frac{1}{\log. r};$$

hence we find

$$\log. y \text{ to base } r=\frac{\log. e}{\log. r}\times\log. y \text{ to base } e.$$

Let the value already found for the logarithm of y to base e be substituted in this equation, and it becomes

$$\log. y=x=\frac{\log. e}{\log. r}\left\{y-1-\frac{(y-1)^2}{2}+\frac{(y-1)^3}{3}-\frac{(y-1)^4}{4}+\&c.\right\}$$

which is a general formula for the logarithm of *any number whatever*, to the base r. And it is to be recollected that in the fraction $\frac{\log. e}{\log. r}$, which is a common multiplier to the series, the logarithms are to be taken according to the same base, which however may be any number whatever.

If in the above formula we suppose $r=e$, the multiplier $\frac{\log. e}{\log. r}$ will be unity, and the formula will become simply

$$\log. y=y-1-\frac{(y-1)^2}{2}+\frac{(y-1)^3}{3}-\frac{(y-1)^4}{4}+\&c.$$

as we have already remarked. Now this is the system which was adopted by Lord Napier; and although the logarithms which were computed according to this system, or upon the supposition that the radical number is 2·7182818, &c. have been called *hyperbolic logarithms*, because they happen to be proportional to certain hyperbolic spaces, yet, as the logarithms of every system have the same property, it is more proper to call them *Napierian logarithms*.

As the constant multiplier $\frac{\log. e}{\log. r}$, which occurs in the general formula for the logarithm of any number, is the only part of the formula which depends for its value upon the base of the system, it has been called by writers on logarithms the *modulus* of the system. If we suppose the logarithms taken to the base e, then the numerator, viz. log. e, will be unity, and the denominator will be the Napierian logarithm of r. If however we suppose the logarithms taken to the base r, then the numerator will be log. e to base r; and the denominator will be unity, so that the *modulus* of any system whose base is r, is *the reciprocal of the Napierian logarithm of that base;* or it is *the logarithm of the number e* (the base of the Napierian system) *to the base r.*

In the Napierian system, the *modulus* is unity, and hence the logarithms of this system are more easily computed than those of any other. It was, however, soon found that a system whose base should be the same as the root of the scale of the arithmetical notation, viz. the number 10, would be the most convenient of any in practice; and accordingly such a system was actually constructed by Mr Briggs. This is the only one now in common use, and is called *Briggs's system*, also *the common system* of logarithms. The *modulus* of this system therefore is the reciprocal of the Napierian logarithm of 10, viz. ·43429448, which is the common logarithm of $e=2·7182818$, &c. the base of the Napierian system. We shall in future denote this *modulus* by M; so that the formula expressing the common logarithm of any number y will be

$$\log. y=M\left\{1-y-\frac{(1-y)^2}{2}+\frac{(1-y)^3}{3}-\frac{(1-y)^4}{4}+\&c.\right\}$$

If the number y, whose logarithm is required, be very near to unity, so that $1-y$ is a small quantity, then the logarithm may be found from this formula with great ease, because the series will converge very rapidly. If, however, $1-y$ be greater than unity, the series, instead of converging, will diverge, so as to be, in its present form, of no use.

It may, however, be transformed into another, which shall converge in every case, by substituting in it $\sqrt[n]{y}$ instead of y, and observing that $\log.\ (\sqrt[n]{y}) = \frac{\log.\ y}{n}$; it thus becomes

$$\log. y = n\mathrm{M}\{\sqrt[n]{y}-1-\tfrac{1}{2}(\sqrt[n]{y}-1)^2+\tfrac{1}{3}(\sqrt[n]{y}-1)^3-\&c.\}$$

where n may denote any number, positive or negative. But whatever be the number y, we can always take n, such, that $\sqrt[n]{y}$ shall be as near to 1 as we please; therefore, by this last formula, we can always find the logarithm of y to any degree of accuracy.

If n be taken negative, then $\sqrt[n]{y} = \frac{1}{\sqrt[n]{y}}$, and the series for $\log.\ y$ becomes, by changing the signs,

$$\log. y = n\mathrm{M}\left\{1-\frac{1}{\sqrt[n]{y}}+\tfrac{1}{2}\left(1-\frac{1}{\sqrt[n]{y}}\right)^2+\tfrac{1}{3}\left(1-\frac{1}{\sqrt[n]{y}}\right)^3 + \&c.\right\}$$

where all the terms are positive. Thus we have it in our power to express the value of y, either by a series which shall have its terms all positive, or by one which shall have its terms alternately positive and negative: for it is evident that if y be greater than unity, $\sqrt[n]{y}$ will also be greater than unity, and *vice versa;* but the differences will be so much the smaller as n the exponent of the root is greater; therefore $\sqrt[n]{y}-1$ will be positive in the first case, and negative in the second.

Because Nap. log. $10 = \frac{1}{\mathrm{M}}$, we have by the two last formulas

$$\frac{1}{\mathrm{M}} = n\{\sqrt[n]{10}-1-\tfrac{1}{2}(\sqrt[n]{10}-1)^2+\tfrac{1}{3}(\sqrt[n]{10}-1)^3 - \&c.\}$$

also

$$\frac{1}{\mathrm{M}} = n\left\{1-\frac{1}{\sqrt[n]{10}}+\tfrac{1}{2}\left(1-\frac{1}{\sqrt[n]{10}}\right)^2+\tfrac{1}{3}\left(1-\frac{1}{\sqrt[n]{10}}\right)^3 + \&c.\right\}$$

It is evident, that by giving to $\sqrt[n]{y}$ such a value that $\sqrt[n]{y}-1$ is a fraction less than unity, we render both the series for the value of $\log.\ y$ converging; for then the expression $1-\frac{1}{\sqrt[n]{y}}$ will also be less than unity, seeing it is equal $\frac{\sqrt[n]{y}-1}{\sqrt[n]{y}}$. Therefore, in the first series, the second and third terms (taken together as one term) constitute a negative quantity; and as the same is also true of the fourth and fifth, and so on, the amount of all the terms after the first is a negative quantity, or one which is to be subtracted from the first, to obtain the value of log y. Hence

$$\log. y \angle n\mathrm{M}(\sqrt[n]{y}-1).$$

And since, on the contrary, the terms of the second series are all positive, the amount of all the terms after the first is a positive quantity, or one which must be added to the first to give the value of $\log.\ y$; so that

$$\log. y \mathrel{7} n\mathrm{M}\left(1-\frac{1}{\sqrt[n]{y}}\right).$$

Thus we have two limits to the value of the logarithm of y, which, by taking the number n sufficiently great, may come as near to each other as we please.

In like manner we find two limits to the value of the reciprocal to the modulus, viz.

$$\frac{1}{\mathrm{M}} \angle n(\sqrt[n]{10}-1),\ \frac{1}{\mathrm{M}} \mathrel{7} n\left(1-\frac{1}{\sqrt[n]{10}}\right).$$

It is evident that the difference between the two limits of $\log.\ y$, is

$$n\mathrm{M}\left\{(\sqrt[n]{y}-1)-\left(1-\frac{1}{\sqrt[n]{y}}\right)\right\},$$

therefore, if we take either the one or the other of the two preceding expressions for log y, the error in excess or defect is necessarily less than this quantity.

By these formulæ we may depend upon having the logarithm of any number true to m figures, if we give to n such a value that the root $\sqrt[n]{y}$ shall have m ciphers between the decimal point and the first significant figure on the right. So that in general, as the error is the smaller as n the exponent of the root is greater, it may be neglected when n is taken indefinitely great; and this being the case, we may conclude that either of these expressions,

$$n\mathrm{M}(\sqrt[n]{y}-1),\ n\mathrm{M}\left(1-\frac{1}{\sqrt[n]{y}}\right)$$

is the accurate value of $\log.\ y$.

The best manner of applying the preceding formula is to take some power of the number 2 for n; for by doing so, the root $\sqrt[n]{y}$ may be found by a repetition of extractions of the square root only. It was in this way that Briggs calculated the first logarithms; and he remarked, that if in performing the successive extractions of the square root, he at last obtained twice as many decimal places as there were ciphers after the decimal point, the integer before it being unity, then the decimal part of this root was exactly the half of that which went before; so that the decimal parts of the two roots were to each other in the same proportion as their logarithms: now this is an evident consequence of the preceding formula.

To give an example of the application of the formula, let it be required to find the numerical value of M, the modulus of the common system of logarithms, which, as it is the reciprocal of the Napierian logarithm of 10, is

$$\frac{1}{n} \times \frac{1}{\sqrt[n]{10}-1} \text{ nearly,}$$

when n is some very great number. Let us suppose $n = 2^{60} = 8^{20}$; then, dividing unity by 8, and this result again by 8, and so on, we shall, after 20 divisions, have $\frac{1}{n}$, or $\frac{1}{8^{20}}$, equal to

0·00000 00000 00000 00086 73617 37988 40354.

Also, by extracting the square root of 10, and the square root of this result, and so on, after performing 60 extractions we shall find $\sqrt[n]{10}$ equal to

1·00000 00000 00000 00199 71742 08125 50527 03251.

Therefore, $\frac{1}{n} \times \frac{1}{\sqrt[n]{10}-1}$, or M is equal to

$$\frac{86736173798840354}{199717420812550527} = 0{\cdot}4342944819.$$

As a second example, let it be required to find by the same formula the logarithm of 3, which is nearly

$$n\mathrm{M}(\sqrt[n]{3}-1) = \frac{n(\sqrt[n]{3}-1)}{n(\sqrt[n]{10}-1)} = \frac{\sqrt[n]{3}-1}{\sqrt[n]{10}-1},$$

n being as before a very great number. Let us suppose also in this case that $n = 2^{60}$; then after 60 extractions of the square root we have $\sqrt[n]{3}$ equal to

1·00000 00000 00000 0095 28942 64074 58932.

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Therefore, taking the value of ${}^{n}\sqrt{10}$ as found in last example, we have

$$\log. 3 = \frac{{}^{n}\sqrt{3}-1}{\sqrt{10}-1} = \frac{95289426407458932}{199717420812550527}$$
$$= \cdot 477121254719662.$$

This method of computing logarithms is evidently attended with great labour, on account of the number of extractions of roots which it requires to obtain a result true to a moderate number of places of figures. But the two series which we have given serve to simplify and complete it. For, whatever be the number y, it is only necessary to proceed with the extractions of the square root, till we have obtained for ${}^{n}\sqrt{y}$ a value which is unity followed by a decimal fraction; and then ${}^{n}\sqrt{y}-1$ being a fraction, its powers will also be fractions so much the smaller as their exponents are greater; thus a certain number of terms of the series will express the logarithm to as many decimal places as may be required.

There are yet other artifices by which the series $\log. y = \mathrm{M}\{y-1-\frac{1}{2}(y-1)^2+\frac{1}{3}(y-1)^3-\frac{1}{4}(y-1)^4+\&c.\}$ may be transformed into others which shall always converge, and in particular the following. Let $1+u$ be substituted in the series for y; then it becomes

$$\log. (1+u) = \mathrm{M}\left(u-\frac{u^2}{2}+\frac{u^3}{3}-\frac{u^4}{4}+\frac{u^5}{5}-\&c.\right)$$

In like manner, if $1-u$ be substituted for y, we have

$$\log. (1-u) = \mathrm{M}\left(-u-\frac{u^2}{2}-\frac{u^3}{3}-\frac{u^4}{4}-\frac{u^5}{5}-\&c.\right)$$

Let the latter equation be subtracted from the former; and since $\log. (1+u)-\log. (1-u)$, is equal to $\log. \frac{1+u}{1-u}$; we shall have

$$\log. \frac{1+u}{1-u} = 2\mathrm{M}\left\{u+\frac{u^3}{3}+\frac{u^5}{5}+\frac{u^7}{7}+\&c.\right\},$$

which series, by substituting z for $\frac{1+u}{1-u}$, and consequently $\frac{z-1}{z+1}$ for u, will be otherwise expressed thus,

$$\log. z = 2\mathrm{M}\left\{\frac{z-1}{z+1}+\tfrac{1}{3}\left(\frac{z-1}{z+1}\right)^3+\tfrac{1}{5}\left(\frac{z-1}{z+1}\right)^5+\&c.\right\};$$

which is not only simple, but has also the property of converging in every case.

As an example of the utility of this formula, we shall employ it to compute the Napierian logarithm of 2, which will be

$$2\left(\frac{1}{3}+\frac{1}{3\cdot 3^3}+\frac{1}{5\cdot 3^5}+\frac{1}{7\cdot 3^7}+\frac{1}{9\cdot 3^9}+\&c.\right)$$
$$= \mathrm{A}+\tfrac{1}{3}\mathrm{B}+\tfrac{1}{5}\mathrm{C}+\tfrac{1}{7}\mathrm{D}+\tfrac{1}{9}\mathrm{E}+\&c.$$

where A is put for $\frac{2}{3}$, B for $\frac{2}{3^3}=\frac{\mathrm{A}}{9}$, C for $\frac{2}{3^5}=\frac{\mathrm{B}}{9}$, D for $\frac{2}{3^7}=\frac{\mathrm{C}}{9}$, &c. The calculation will be as follows:

$$\begin{aligned}
\mathrm{A} &= \phantom{\tfrac{1}{9}\mathrm{A} =}\ \cdot 666666666666\\
\mathrm{B} &= \tfrac{1}{9}\mathrm{A} = \cdot 074074074074\\
\mathrm{C} &= \tfrac{1}{9}\mathrm{B} = \cdot 008230452674\\
\mathrm{D} &= \tfrac{1}{9}\mathrm{C} = \cdot 000914494742\\
\mathrm{E} &= \tfrac{1}{9}\mathrm{D} = \cdot 000101610527\\
\mathrm{F} &= \tfrac{1}{9}\mathrm{E} = \cdot 000011290059\\
\mathrm{G} &= \tfrac{1}{9}\mathrm{F} = \cdot 000001254451\\
\mathrm{H} &= \tfrac{1}{9}\mathrm{G} = \cdot 000000139383\\
\mathrm{I} &= \tfrac{1}{9}\mathrm{H} = \cdot 000000015487\\
\mathrm{K} &= \tfrac{1}{9}\mathrm{I} = \cdot 000000001721\\
\mathrm{L} &= \tfrac{1}{9}\mathrm{K} = \cdot 000000000191\\
\mathrm{M} &= \tfrac{1}{9}\mathrm{L} = \cdot 000000000021
\end{aligned}$$

$$\begin{aligned}
\mathrm{A} &= \cdot 666666666666\\
\tfrac{1}{3}\mathrm{B} &= \cdot 024691358025\\
\tfrac{1}{5}\mathrm{C} &= \cdot 001646090535\\
\tfrac{1}{7}\mathrm{D} &= \cdot 000130642106\\
\tfrac{1}{9}\mathrm{E} &= \cdot 000011290056\\
\tfrac{1}{11}\mathrm{F} &= \cdot 000001026369\\
\tfrac{1}{13}\mathrm{G} &= \cdot 000000096496\\
\tfrac{1}{15}\mathrm{H} &= \cdot 000000009292\\
\tfrac{1}{17}\mathrm{K} &= \cdot 000000000911\\
\tfrac{1}{19}\mathrm{L} &= \cdot 000000000091\\
\tfrac{1}{21}\mathrm{M} &= \cdot 000000000001\\
\hline
\text{Nap. log. } 2 &= \cdot 693147180551
\end{aligned}$$

Thus, by a very easy calculation, we have obtained the Napierian logarithm of 2 true to the first ten places of figures; the accurate value, as far as the 12th place, being 0·693147180560.

If this very simple process, by which we have found the logarithm of 2 (the whole of which is here actually put down), be compared with the laborious calculations which must have been performed to have found the same logarithm by the method explained in the beginning of this section, the great superiority of this method to the other, and even to the second method, by which we found the value of M, and the logarithm of 3, must be very apparent.

In the same manner as we have found the logarithm of 2, we may find those of 3, 5, &c. In computing the logarithm of 3, the series would converge by the powers of the fraction $\frac{3-1}{3+1}=\frac{1}{2}$, and in computing the logarithm of 5 it would converge by the powers of $\frac{5-1}{5+1}=\frac{2}{3}$; but in each of these cases the series would converge slower, and of course the labour would be greater than in computing the logarithm of 2. And if the number whose logarithm was required was still more considerable; as, for example, 199, the series would converge so slow as to be useless.

We may however avoid this inconvenience by again transforming this last formula into another which shall express the logarithm of any number by means of a series, and a logarithm supposed to be previously known. To effect this new transformation, let $\frac{1+u}{1-u}=1+\frac{z}{n}$, and consequently $u=\frac{z}{2n+z}$, these values being substituted in the formula, $\log. \frac{1+u}{1-u}=2\mathrm{M}\left(u+\frac{u^3}{3}+\frac{u^5}{5}+\frac{u^7}{7}+\&c.\right)$ we have $\log. \left(1+\frac{z}{n}\right)$ equal to

$$2\mathrm{M}\left\{\frac{z}{2n+z}+\tfrac{1}{3}\left(\frac{z}{2n+z}\right)^3+\tfrac{1}{5}\left(\frac{z}{2n+z}\right)^5+\&c.\right\}$$

but $\log. \left(1+\frac{z}{n}\right)=\log. \frac{n+z}{n}=\log. (n+z)-\log. n$, therefore, $\log. (n+z)=\log. n+$

$$2\mathrm{M}\left\{\frac{z}{2n+z}+\tfrac{1}{3}\left(\frac{z}{2n+z}\right)^3+\tfrac{1}{5}\left(\frac{z}{2n+z}\right)^5+\&c.\right\}$$

By the assistance of this formula, and the known properties of logarithms, we may proceed calculating the logarithm of one number from that of another as follows.

To find the Napierian logarithm of 3 from that of 2, already found. We have here $n=2$, $z=1$, and $\frac{z}{2n+z}=\frac{1}{5}$. Therefore the logarithm of 3 is

$$\log. 2+2\left(\frac{1}{5}+\frac{1}{3\cdot 5^3}+\frac{1}{5\cdot 5^5}+\frac{1}{7\cdot 5^7}+\&c.\right)$$
$$= \log. 2+\mathrm{A}+\tfrac{1}{3}\mathrm{B}+\tfrac{1}{5}\mathrm{C}+\tfrac{1}{7}\mathrm{D}+\tfrac{1}{9}\mathrm{E}+\&c.$$

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where A is put for $\frac{2}{5}$, B for $\frac{A}{25}$, C for $\frac{B}{25}$, and so on.

The calculation may stand thus:

$$\begin{array}{rl}
A & = \cdot 400000000000 \\
B = \frac{1}{25}\,A & = \cdot 016000000000 \\
C = \frac{1}{25}\,B & = \cdot 000640000000 \\
D = \frac{1}{25}\,C & = \cdot 000025600000 \\
E = \frac{1}{25}\,D & = \cdot 000001024000 \\
F = \frac{1}{25}\,E & = \cdot 000000040960 \\
G = \frac{1}{25}\,F & = \cdot 000000001638 \\
H = \frac{1}{25}\,G & = \cdot 000000000066
\end{array}$$

$$\begin{array}{rl}
A & = \cdot 400000000000 \\
\frac{1}{3}\,B & = \cdot 005333333333 \\
\frac{1}{5}\,C & = \cdot 000128000000 \\
\frac{1}{7}\,D & = \cdot 000003657143 \\
\frac{1}{9}\,E & = \cdot 000000113778 \\
\frac{1}{11}\,F & = \cdot 000000003724 \\
\frac{1}{13}\,G & = \cdot 000000000126 \\
\frac{1}{15}\,H & = \cdot 000000000004 \\
\hline
 & \ \cdot 405465108108 \\
\text{Nap. log. } 2 & = \cdot 693147180551 \\
\hline
\text{Nap. log. } 3 & = 1\cdot 098612288659
\end{array}$$

This logarithm is true to 10 decimal places, the accurate value to 12 figures being 1·098612288668, which would have been our result had the correct value of log. 2, viz. ·693147180560 been employed.

The Napierian logarithm of 4 is immediately had from that of 2 by considering that as $4 = 2^2$, therefore log. 4 = log. 2 + log. 2.

$$\begin{array}{rl}
\text{Nap. log. } 2 & = \cdot 693147180551 \\
 & 2 \\
\hline
\text{Nap. log. } 4 & = 1\cdot 386294361102
\end{array}$$

This is also true to 10 places besides the integer.

To find the Napierian logarithm of 5, from that of 4; we have $n = 4$, $z = 1$, and $\frac{z}{2n+1} = \frac{1}{9}$, therefore the logarithm of 5 is expressed by

$$\text{log. } 4 + 2\left(\frac{1}{9} + \frac{1}{3 \cdot 9^3} + \frac{1}{5 \cdot 9^5} + \frac{1}{7 \cdot 9^7} + \text{\&c.}\right)$$

$$\text{log. } 4 + A + \tfrac{1}{3}B + \tfrac{1}{5}C + \tfrac{1}{7}D + \text{\&c.}$$

where $A = \frac{2}{9}$, $B = \frac{1}{81}A$, $C = \frac{1}{81}B$, &c.

The calculation.

$$\begin{array}{rl}
A & = \cdot 222222222222 \\
B = \frac{1}{81}\,A & = \cdot 002743484225 \\
C = \frac{1}{81}\,B & = \cdot 000033870176 \\
D = \frac{1}{81}\,C & = \cdot 000000418150 \\
E = \frac{1}{81}\,D & = \cdot 000000005162 \\
F = \frac{1}{81}\,E & = \cdot 000000000064
\end{array}$$

$$\begin{array}{rl}
A & = \cdot 222222222222 \\
\frac{1}{3}\,B & = \cdot 000914494742 \\
\frac{1}{5}\,C & = \cdot 000006774035 \\
\frac{1}{7}\,D & = \cdot 000000059736 \\
\frac{1}{9}\,E & = \cdot 000000000574 \\
\frac{1}{11}\,F & = \cdot 000000000006 \\
\hline
 & \ \cdot 223143551315 \\
\text{Nap. log. } 4 & = 1\cdot 386294361102 \\
\hline
\text{Nap. log. } 5 & = 1\cdot 609437912417
\end{array}$$

This result is also correct to the first ten places.

The logarithm of 6 is found from those of 2 and 3, because 6 = 2 × 3, therefore log. 6 = log. 2 + log. 3.

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$$\begin{array}{rl}
\text{Nap. log. } 2 & = 0\cdot 693147180551 \\
\text{Nap. log. } 3 & = 1\cdot 098612288659 \\
\hline
\text{Nap. log. } 6 & = 1\cdot 761759469210
\end{array}$$

This result is correct as far as the tenth decimal place.

We might find the logarithm of 7 from that of 6, that is, from the logarithms of 3 and 2, in the same manner as we have found the logarithms of 5 and 3; but it may be more readily found from the logarithms of 2 and 5 thus. Because $\frac{2 \times 5^2}{7^2} = \frac{50}{49}$, therefore log. 2 + 2 log. 5 — 2 log. 7 = log. $\frac{50}{49}$, and consequently

$$\text{log. } 7 = \tfrac{1}{2}\text{log. } 2 + \text{log. } 5 - \tfrac{1}{2}\text{log. } \frac{50}{49}.$$

Now the logarithm of $\frac{50}{49}$ may be readily obtained from

$$\text{log. } z = 2M\left\{\frac{z-1}{z+1} + \tfrac{1}{3}\left(\frac{z-1}{z+1}\right)^3 + \tfrac{1}{5}\left(\frac{z-1}{z+1}\right)^5 + \text{\&c.}\right\}$$

For, substituting $\frac{50}{49}$ for z, the formula gives

$$\begin{aligned}
\text{Nap. log. } \frac{50}{49} &= 2\left(\frac{1}{99} + \frac{1}{3 \cdot 99^3} + \frac{1}{5 \cdot 99^5} + \text{\&c.}\right) \\
&= A + \tfrac{1}{3}B + \tfrac{1}{5}C + \text{\&c.}
\end{aligned}$$

where $A = \frac{2}{9 \cdot 11}$, $B = \frac{A}{9^2 \cdot 11^2}$, $C = \frac{B}{9^2 \cdot 11^2}$, &c. This series converges with great rapidity, and a few of its terms will be sufficient to give the logarithm of 7, as appears from the following operation.

$$\begin{array}{rl}
A & = \cdot 020202020202 \\
B = \frac{1}{9^2 \cdot 11^2}\,A & = \cdot 000002061220 \\
C = \frac{1}{9^2 \cdot 11^2}\,B & = \cdot 000000000210
\end{array}$$

$$\begin{array}{rl}
A & = \cdot 020202020202 \\
\frac{1}{3}B & = \cdot 000000687073 \\
\frac{1}{5}C & = \cdot 000000000042 \\
\hline
\text{Nap. log. } \frac{50}{49} & = \cdot 020202707317
\end{array}$$

$$\begin{array}{rl}
\frac{1}{2}\text{log. } 2 & = 0\cdot 346573590275 \\
\text{log. } 5 & = 1\cdot 609437912417 \\
\hline
 & \ 1\cdot 956011502692 \\
\frac{1}{2}\text{log. } \frac{50}{49} & = 0\cdot 010101353658 \\
\hline
\text{Nap. log. } 7 & = 1\cdot 945910149034
\end{array}$$

This logarithm, like those we found before, is correct in the first ten decimal places.

The logarithms of 8, 9, and 10 are immediately obtained from those of 2, 3, and 5, as follows:

$$\begin{array}{rl}
\text{Nap. log. } 2 & = 0\cdot 693147180551 \\
 & 3 \\
\hline
\text{Nap. log. } 8 & = 2\cdot 079441541653
\end{array}$$

$$\begin{array}{rl}
\text{Nap. log. } 3 & = 1\cdot 098612288659 \\
 & 2 \\
\hline
\text{Nap. log. } 9 & = 2\cdot 197224577318
\end{array}$$

$$\begin{array}{rl}
\text{Nap. log. } 2 & = 0\cdot 693147180551 \\
\text{Nap. log. } 5 & = 1\cdot 609437912417 \\
\hline
\text{Nap. log. } 10 & = 2\cdot 302585092968
\end{array}$$

Thus by a few calculations we have found the Napierian logarithms of the first ten numbers, each true to ten decimal places; and since the Napierian logarithm of 10 is now known, the *modulus* of the common system, which is the reciprocal of that logarithm, will also be known, and will be

$$\frac{}{2\cdot302585092968} = \cdot4342944819.$$

The common logarithms of the first ten numbers may now be found from the Napierian logarithms by multiplying each of the latter by the *modulus*, or dividing by its reciprocal, that is, by the Napierian logarithm of 10. And as the *modulus* of the common system is so important an element in the theory of logarithms, we shall give its value, together with that of its reciprocal, as far as the 30th decimal place.

$$\text{M} = \cdot434294481903251827651128918916$$

$$\frac{1}{\text{M}} = 2\cdot302585092994045684017991454684$$

The formulæ already given are sufficient for finding the logarithms of all numbers whatever throughout the table; but there are yet others which may often be applied with great advantage, and we shall now investigate some of these.

Because

$$\text{log. } z = 2\text{M}\left\{\frac{z-1}{z+1} + \tfrac{1}{3}\left(\frac{z-1}{z+1}\right)^3 + \tfrac{1}{5}\left(\frac{z-1}{z+1}\right) \text{ \&c.}\right\}$$

If we now suppose

$$z = \frac{n^2}{n^2-1} = \frac{n^2}{(n-1)(n+1)},$$

so that $\frac{z-1}{z+1} = \frac{1}{2n^2-1}$, then the formula becomes

$$\text{log. } \frac{n^2}{(n-1)(n+1)} = 2\text{M}\left\{\frac{1}{2n^2-1} + \tfrac{1}{3}\left(\frac{1}{2n^2-1}\right)^3 + \tfrac{1}{5}\left(\frac{1}{2n^2-1}\right)^5 + \text{ \&c.}\right\}$$

But $\text{log. } \frac{n^2}{(n-1)(n+1)} = 2 \text{ log. } n - \text{log. } (n-1) - \text{log. } (n+1)$, therefore, putting N for the series

$$2\text{M}\left\{\frac{1}{2n^2-1} + \tfrac{1}{3}\left(\frac{1}{2n^2-1}\right)^3 + \tfrac{1}{5}\left(\frac{1}{2n^2-1}\right)^5 + \text{ \&c.}\right\}$$

we have this formula,

$$2 \text{ log. } n - \text{log. } (n-1) - \text{log. } (n+1) = \text{N};$$

and hence, as often as we have the logarithms of any two of three numbers whose common difference is unity, the logarithm of the remaining number may be found. Example: Given log. 9 = 0·95424250943, log. 10 = 1; to find the common logarithm of 11.

Here we have $n = 10$, so that the formula gives in this case 2 log. 10 — log. 9 — log. 11 = N, and hence we have

$$\text{log. } 11 = 2 \text{ log. } 10 - \text{log. } 9 - \text{N},$$

$$\text{where N} = \frac{2\text{M}}{199} + \frac{2\text{M}}{3\cdot199^3} + \text{ \&c.}$$

M being ·43429448190.

Calculation of N.

$$\text{A} = \frac{2\text{M}}{199} = \cdot00436476866$$

$$\text{B} = \frac{\text{A}}{3\cdot199^2} = \cdot00000003674$$

$$\begin{aligned} \text{N} &= 0\cdot00436480540 \\ \text{log. } 9 &= 0\cdot95424250943 \\ \hline \text{log. } 9 + \text{N} &= 0\cdot95860731483 \\ 2 \text{ log. } 10 &= 2\cdot00000000000 \\ \hline \text{log. } 11 &= 1\cdot04139268517 \end{aligned}$$

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Here the series expressed by N converges very fast, so that two of its terms are sufficient to give the logarithm true to 10 places of decimals. But the logarithm of 11 may be expressed by the logarithms of smaller numbers, and a series which converges still more rapidly, by the following artifice, which will apply also to some other numbers. Because the numbers 98, 99, and 100 are the products of numbers, the greatest of which is 11, for $98 = 2 \times 7^2$, $99 = 9 \times 11$, and $100 = 10 \times 10$, it follows that if we have an equation composed of terms which are the logarithms of these three numbers, it may be resolved into another, the terms of which shall be the logarithms of the number 11 and other smaller numbers. Now by the preceding formula, if we put 99 for n, we have

$$2 \text{ log. } 99 - \text{log. } 98 - \text{log. } 100 = \text{N},$$

that is, substituting log. 9 + log. 11 for log. 99, log. 2 + 2 log. 7 for log. 98, and 2 log. 10 for log. 100,

$$2 \text{ log. } 9 + 2 \text{ log. } 11 - \text{log. } 2 - 2 \text{ log. } 7 - 2 \text{ log. } 10 = \text{N},$$

and hence by transposition, &c.

$$\text{log. } 11 = \tfrac{1}{2}\text{N} + \tfrac{1}{2}\text{log. } 2 + \text{log. } 7 - \text{log. } 9 + \text{log. } 10;$$

and in this equation

$$\text{N} = \frac{2\text{M}}{19601} + \tfrac{1}{3}\,\frac{2\text{M}}{19601^3} + \text{ \&c.}$$

The first term alone of this series is sufficient to give the logarithm of 11 true to 14 places.

Another formula, by which the logarithm of a number is expressed by the logarithms of other numbers and a series, may be found as follows.

Resuming the formula

$$\text{log. } z = 2\text{M}\left\{\frac{z-1}{z+1} + \tfrac{1}{3}\left(\frac{z-1}{z+1}\right)^3 + \tfrac{1}{5}\left(\frac{z-1}{z+1}\right)^5 + \text{ \&c.}\right\}$$

$$\text{put } z = \frac{(n-1)^2\,(n+2)}{(n-2)\,(n+1)^2} = \frac{n^3-3\,n+2}{n^3-3\,n-2},$$

$$\text{then } \frac{z-1}{z+1} = \frac{2}{n^3-3n}.$$

Let these values of z, and $\frac{z-1}{z+1}$, be substituted in the formula, and it becomes

$$\text{log. } \frac{(n-1)^2(n+2)}{(n-2)(n+1)^2} = 2\text{M}\left\{\frac{2}{n^3-3n} + \tfrac{1}{3}\left(\frac{3}{n^3-3n}\right)^3 + \text{ \&c.}\right\}$$

But the quantity on the left-hand side of this equation is manifestly equal to 2 log. $(n-1)$ + log. $(n+2)$ — log. $(n-2)$ — 2 log. $(n+1)$; therefore, putting P for the series,

$$2\text{M}\left\{\frac{2}{n^3-3n} + \tfrac{1}{3}\left(\frac{2}{n^3-3n}\right)^3 + \tfrac{1}{5}\left(\frac{2}{n^3-3n}\right)^5 + \text{ \&c.}\right\}$$

we have this formula,

$$\text{log.}(n+2) + 2 \text{ log.}(n-1) - \text{log.}(n-2) - 2 \text{ log.}(n+1) = \text{P}.$$

By this formula we may find, with great facility, the logarithm of any one of the four numbers $n-2$, $n-1$, $n+1$, $n+2$, having the logarithms of the other three. We may also employ it in the calculation of logarithms, as in the following example. Let the numbers 5, 6, 7, 8, be substituted successively in the formula; then, observing that log. 6 = log. 2 + log. 3, and log. 8 = 3 log. 2, we have these four equations,

$$\text{log. } 7 + 2 \text{ log. } 2 - 3 \text{ log. } 3 = \frac{2\text{M}}{55} + \frac{2\text{M}}{3\cdot55^3} + \text{ \&c.}$$

$$-2 \text{ log. } 7 + \text{log. } 2 + 2 \text{ log. } 5 = \frac{2\text{M}}{99} + \frac{2\text{M}}{3\cdot99^3} + \text{ \&c.}$$

$$4 \text{ log. } 3 - 4 \text{ log. } 2 - \text{log. } 5 = \frac{2\text{M}}{161} + \frac{2\text{M}}{3\cdot161^3} + \text{ \&c.}$$

$$\text{log. } 5 - 5 \text{ log. } 3 + 2 \text{ log. } 7 = \frac{2\text{M}}{244} + \frac{2\text{M}}{3\cdot244^3} + \text{ \&c.}$$

Let log. 2, log. 3, log. 5, and log. 7, be now considered as

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four unknown quantities, and by resolving those equations in the usual manner, the logarithms may be determined.

Resuming once more the formula

$$\log.\, z = 2\mathrm{M}\left\{\frac{z-1}{z+1}+\tfrac{1}{3}\left(\frac{z-1}{z+1}\right)^3+\&c.\right\}$$

let $\dfrac{n^2(n+5)(n-5)}{(n+3)(n-3)(n+4)(n-4)}$ be substituted in it instead of z, then, by this substitution, $\dfrac{z-1}{z+1}$ will become $\dfrac{-72}{n^4-25n^2+72}$, and the formula will be transformed to

$$\log.\, \frac{n^2(n+5)(n-5)}{(n+3)(n-3)(n+4)(n-4)}$$
$$=-2\mathrm{M}\left\{\frac{72}{n^4-25n^2+72}+\tfrac{1}{3}\left(\frac{72}{n^4-25n^2+72}\right)^3+\&c.\right\}$$

Hence, putting the latter side of this equation equal to Q, we have this formula,

$$\left.\begin{matrix}2\log.\, n+\log.\,(n+5)+\log.\,(n-5)-\log.\,(n+3)\\ -\log.\,(n-3)-\log.\,(n+4)-\log.\,(n-4)+\mathrm{Q}\end{matrix}\right\}=0$$

which may be applied in the calculation of logarithms in the same manner as the former.

But when it is required to find the logarithm of a higher number, as, for example, 1231, we may proceed as follows.

$$\log.\, 1231=\log.\,(1230+1)=\log.\left\{1230\left(1+\frac{1}{1230}\right)\right\}$$
$$=\log.\, 1230+\log.\left(1+\frac{1}{1230}\right).$$

Again, $\log.\, 1230 = \log.\, 2 + \log.\, 5 + \log.\, 123$, and $\log.\, 123 = \log.\left\{120\left(1+\frac{1}{40}\right)\right\} = \log.\, 120 + \log.\left(1+\frac{1}{40}\right)$, $\log.\, 120 = \log.\,(2^3 \times 3 \times 5) = 3\log.\, 2 + \log.\, 3 + \log.\, 5$. Therefore $\log.\, 1231 = 4\log.\, 2 + \log.\, 3 + 2\log.\, 5 +$

$$\log.\left(1+\frac{1}{40}\right)+\log.\left(1+\frac{1}{1230}\right)$$

Thus the logarithm of the proposed number is expressed by the logarithms of 2, 3, 5, and the logarithms of $1+\frac{1}{40}$, $1+\frac{1}{1230}$, all of which may be easily found by the formulæ already delivered.

New views of Logarithms.

It may be proper here briefly to notice some new views on the doctrine of logarithms, which have been advanced at considerable length by Mr Graves in the *Philosophical Transactions* for 1829. The discovery made by Poisson and Poinsot, in their researches on angular sections, of errors in trigonometrical formulæ usually deemed complete, drew Mr Graves's attention to what he considered analogous defects in logarithmic series. He accordingly professes, in the paper cited, to exhibit in an amended form two fundamental developments, especially that of the one we have given above of the equation $y = r^x$; but the new formulæ are unfortunately exhibited in such an abstruse and indefinite form, as to be quite unintelligible to most readers, and our limits will not admit of introducing them here with a sufficient explanation. The chief objection made to the ordinary series is, that it only gives one value to y for each value of x; whereas, when x is a rational fraction in its lowest terms, y should have as many values of some sort as there are units in the denominator of x. Thus, when $x = \frac{1}{2}$ and $r = 10$, the value of y being $\pm\sqrt{10}$, may be $-3{\cdot}162277$ as well as $+3{\cdot}162277$; but it is surely never meant that y should ever have more than two possible values, or indeed more than one such value, when the denominator of x is odd.

Mr Graves considers the principles employed in this inquiry as presenting a solution of many difficulties, and illustrating peculiarities in the theory of logarithms of negative quantities; and, when applied to geometry, as furnishing the means of tracing the form and developing the properties of curves whose equations involve exponential quantities. He also states that, by their means, various differential and other formulæ usually exhibited in treatises on logarithms may be rendered complete. He combats the opinion that equations which are numerically false may yet be analytically true; and explains the difficulty by reverting to the limitations inherent in the hypothesis on which the developments are founded. In opposition to John Bernoulli and D'Alembert, he maintains that the logarithms of negative numbers are not in general the same as those of positive ones; and hence infers that negative numbers have occasionally even real logarithms. But several objectionable things in Mr Graves's paper have been pointed out by Mr Peacock, in an able article on analysis in the Third Report of the British Association, page 266; and, indeed, until Mr Graves chooses to put his new views in a more definite and intelligible shape, and to express himself in ordinary mathematical language, we suspect his speculations are not likely to meet with a favourable reception.

In addition to the works already mentioned on the theory of logarithms, the following may be consulted, viz.

James Gregory, *Vera Circuli et Hyperbolæ Quadratura*, 1667.

James Gregory, *Exercitationes Geometricæ*, 1668.

James Gregory, in *Commercium Epistolicum*, 1712.

Mercator, *Logarithmotechnia*, 1668; and *Philosophical Transactions* of same year.

Brouncker and Wallis, *Phil. Trans.* 1668.

Barrow, *Lectiones Geometricæ*, 1674.

Halley, *Phil. Trans.* 1695, 1696.

Jones, *Synopsis Matheseos*, 1706.

Craig, *Phil. Trans.* 1710.

Sir Isaac Newton, *Commercium Epistolicum*.

Sir Isaac Newton, *Method of Fluxions*, 1736.

Cotes, *Phil. Trans.* 1714.

Cotes, *Harmonia Mensurarum*, 1722.

Long, *Phil. Trans.* 1714.

Brooke Taylor, *Phil. Trans.* No. 352.

Dodson, *Phil. Trans.* 1753.

Maseres, *Trigonometry*, 1760.

Maseres, *Scriptores Logarithmici*, which is a valuable collection of the more interesting and scarce tracts on logarithms. It is in six vols. 4to, published from 1791 to 1807.

Waring, *Phil. Trans.* 1779.

Hellins, *Phil. Trans.* 1780–1796.

Lagrange, *Théorie des Fonctions*.

Laplace, *Journal de l'Ecole Polytechnique*, 1809.

Wallace on the Conic Sections, in *Transactions of the Royal Society of Edinb.* vol. vi.

Lavernède, *Annales des Mathématiques*, 1811.

Vincent, *Annales des Mathématiques*, 1824, 1825.

To most of the larger sets of tables is prefixed an introduction on the theory and construction of logarithms.

Easy mode of computing logarithms by interpolation.

The following short article may be fitly introduced here as an addition to the foregoing treatise. It was written by the late Sir John Leslie for the *Supplement* to the former editions of this work, in which it was inserted under the word INTERPOLATION, in the Addenda.

Few disquisitions in modern mathematics have greater practical utility than those concerning the extension and

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interpolation of the terms of numerical progressions. But the modes of solution generally proposed, however ingenious and refined, are often too complex for ordinary purposes. We shall therefore point out a procedure of extreme simplicity and most ready application. It will embrace any system of numbers, but seems peculiarly fitted for the computation of logarithms.

Napier first published in 1614 his canon *Mirificus Logarithmorum*, comprised in a very thin and small quarto volume, exhibiting, as far as seven places, the logarithms only of the sines and tangents to every minute of the quadrant; those of the ordinary numbers being left to be deduced from the nearest sines or tangents. In the summer following, Briggs, then professor of geometry in Gresham College at London, who was enchanted by that noble discovery, paid a visit to its illustrious author at Merchiston, in the vicinity of Edinburgh. During an agreeable stay of a month, it was concerted between them to change the natural system of logarithms into another of a more artificial form, but adapted to our denary scale of notation, the labour of the calculation, however, being devolved upon Briggs, as younger, and enjoying robust health. Next season, Briggs performed a second journey to Edinburgh, and showed to Napier a table which he had computed of the new logarithms for the first chiliad or thousand of the series of natural numbers. But the great inventor was now fast declining in years, and expired on the 3d of April 1618. Briggs, employing most skilfully all the abbreviations which ingenuity could devise, prosecuted his most arduous task with such vigour and active perseverance, as to compute, in the space of seven years, to fourteen places of figures, not only the logarithms of the sines and tangents of every degree and centesimal minute of the quadrant, but also the logarithms of thirty chiliads of numbers. These tables were printed in 1624, in a folio volume, entitled *Arithmetica Logarithmica.* In his anxiety, however, to bring out this stupendous work, Briggs contented himself with calculating the logarithms from unit to 20,000, and from 90,000 to 100,000, leaving the computation of the seventy intervening chiliads to be afterwards supplied. The very ingenious author annexed a full explanation of his mode of framing the tables, grounded chiefly on the consideration of differences, and he thus traced the first steps of that important theory. But he likewise gave instructions for the readier filling up of the intermediate logarithms, abridging the toil of calculation no doubt, yet detailing a procedure sufficiently irksome and complicated. "To encourage some skilful persons to perform this task, he offered to furnish them with paper he had by him, ready prepared, and divided into columns proper for that purpose, as likewise to inform them at what part to begin, that they might not interfere one with another; and promised, when the whole was finished, to endeavour to procure a new edition of the work so completed." This slender boon seems not to have tempted the mathematicians in England. In Holland, however, Adrian Vlacq, chancing to meet two years afterwards with a copy of the work, and, prompted only by his patriotic zeal, had the resolution to revise and compute the whole canon, reducing it from fourteen to ten places of figures, which he printed in folio at Gouda, as early as 1628. The same able calculator, only five years afterwards, published, likewise in folio, at Gouda, a very extensive system of logarithmic sines and tangents, to every ten seconds of the quadrant, having restored the sexagesimal subdivision, which Briggs had partly changed into a centesimal one. These two volumes may be deemed a precious *thesaurus* of logarithms, from which succeeding compilers have drawn very liberally. They form the basis of the *Tables* published by Vega at Leipsic in 1794, which, till lately, were the best and completest extant.

But though the *Tables* of Vlacq, carried only to ten places of figures, are sufficiently accurate for every ordinary purpose, and even for the most delicate calculations in astronomy, yet many persons have often regretted that the original system of Briggs was never completed. The celebrated Legendre has employed that table, imperfect as it is, in some of his most refined numerical investigations. It is well known that Mr Baron Maseres devoted a considerable portion of his time and of his fortune to the republication of the works of the early writers on logarithms. In the course of this extensive undertaking, he entertained some thoughts of giving a new edition of the *Arithmetica Logarithmica*, and expressed an earnest wish that the vacant chiliads were filled up. To promote the liberal designs of the baron, the author of this article was induced to bestow some reflection on the subject, and a very simple mode occurred to him, which would have reduced the labour of computing those logarithms to little more than the trouble of mere transcription. But the object of completing the canon was deferred for a time, and afterwards gradually forgotten. The method of interpolation then proposed seems, however, to deserve notice on account of its great simplicity, and its ready application, not only to the immediate object, but to other questions of a similar nature. We shall, therefore, now state the principle, and illustrate its application by a few examples.

The square root of the quantity $a^2 + 1$ is evidently expressed by the continued fraction

$$a + \cfrac{1}{2a + \cfrac{1}{2a + \text{\&c.}}}$$

If two terms only of the fractional part be taken, the expression will become $\sqrt{a^2 + 1} = \frac{4a^3 + 3a}{4a^2 + 1}$, and consequently $\sqrt{\left(\frac{a^2 + 1}{a^2}\right)}$ or $\sqrt{\left(\frac{2a^2 + 2}{2a^2}\right)} = \frac{4a^2 + 3}{4a^2 + 1}$, a very near approximation. Put $b = 2a^2$, and by substitution $\sqrt{\left(\frac{b+2}{b}\right)} = \frac{2b+3}{2b+1}$; wherefore $\frac{1}{2}\log.\frac{b+2}{b} = \log.\frac{2b+3}{2b+1}$. Hence half the differences of the alternate logarithms of the series b, $b + 1$, $b + 2$, &c. added to the logarithm of $2b + 1$, must give the logarithm of $2b + 3$. By this simple process, then, any table of logarithms is carried to double its actual extent through all the odd numbers, those of the even ones being found by the mere addition of the logarithm of 2.

To find the limits of approximation, let three terms of the fractional series be taken, and $\sqrt{\left(\frac{a^2+1}{a^2}\right)} = \frac{8a^4 + 8a^2 + 1}{8a^4 + 4a^2}$, or $\sqrt{\left(\frac{b+2}{b}\right)} = \frac{2b^2 + 4b + 1}{2b^2 + 2b}$

$$= \frac{2b+3}{2b+1}\left(\frac{4b^3 + 10b^2 + 6b + 1}{4b^3 + 10b^2 + 6b}\right)$$

$= \frac{2b+3}{2b+1}\left(1 + \frac{1}{(2b+3)\,(2b+1)b}\right)$. Whence $\frac{1}{2}$ log. $\left(\frac{b+2}{b}\right) = \mathrm{l}\cdot\frac{2b+3}{2b+1} + \mathrm{l}\left(1 + \frac{1}{(2b+3)\,(2b+1)b}\right)$; and, therefore, since this last quantity exceeds unit only by a very minute difference, $\frac{1}{2}\log.\frac{b+2}{2} = \log.\frac{2b+3}{2b+1} + \frac{\mathrm{M}}{(2b+3)\,(2b+1)b}$, where M denotes the modulus of the system. If the number $2b + 3$ or $2b + 1$ be expressed by N, this small correction will amount but to $\frac{M}{\frac{1}{2}N^3}$ or $\frac{2M}{N^3}$. Consequently $\log. \frac{2b+3}{2b+1} = \frac{1}{2} \log. \frac{b+2}{b} - \frac{2M}{N^3}$. It may hence be computed, that the correction on the first approximation will only reach unit in the last figure for the logarithms of numbers under 206 in tables of seven places, for those under 2055 in tables of ten places, and for the logarithms of numbers under 44286 in tables extending to fourteen places.

The corrections required in Briggs's *Tables* of fourteen places will therefore correspond to these limits:

35150	— 2	23151	— 7
30706	— 3	22143	— 8
27899	— 4	21290	— 9
25898	— 5	20557	— 10
24372	— 6	19913	— 11

Suppose it were required to find the logarithms of the odd numbers above 300, to seven places of decimals. Assuming the logarithms of the series of the halves of the intermediate even numbers, let the differences between their alternate terms be taken, and then bisected.

Numbers.	Logarithms.	Alternate Differences.	Their Halves.
150	2·1760913		
151	2·1789769		
152	2·1818436	57523	28761
153	2·1846914	57145	28572
154	2·1875207	56771	28386
155	2·1903317	56403	28201

Numbers.	Logarithms.
301	2·4785665 28761
303	2·4814426 28572
305	2·4842998 28386
307	2·4871384 28201
309	2·4899585

Hence the logarithms of the doubles are formed by the mere addition of these halves.

In this manner the operation may be continued; but, to prevent any accumulation of errors, the logarithms of the composite numbers should serve as standards, being formed by the addition of the logarithms of their several factors. The logarithms of the intermediate even numbers 302, 304, 306, 308, and 310, are easily determined by adding ·3010300 to the logarithms of 151, 152, 153, 154, and 155.

To extend the process a little farther, let Vlacq's logarithms be computed for the numbers above 4000.

Numbers.	Logarithms.	Alternate Differences.	Their Halves.
2000	3·3010299957		
2001	3·3012470886		
2002	3·3014640731	4340774	2170387
2003	3·3016809493	4338607	2169303
2004	5·3018977172	4336441	2168220
2005	3·3021143770	4334277	2167139

Whence are derived,

Numbers.	Logarithms.
4001	3·8021885514 2170387
4003	3·6023855901 2169303
4005	3·6026025204 2168220
4007	3·6028193424 2167139
4009	3·6030360563

Again, to compute the logarithms in Briggs's Canon.

Numbers.	Logarithms.	Alternate Differences.	Their Halves.
9995	3·99978279845413		
9996	3·99982624745441		
9997	3·99986969210827	8689365414	4344682707
9998	3·99991313241658	8688496217	4344248108
9999	3·99995656838020	8687627193	4343813596
10000	4·00000000000000	8686758342	4343379171
19991	4·30083451916161 4344682696	The additive parts here consist of those half differences diminished by 11 and the last one by 10, since the numbers now approach to the limit 20557.	
19993	4·30087796598857 4344248097		
19995	4·30092140846954 4343813585		
19997	4·30096484660539 4343379161		
19999	4·30100828039700		

The first mode of interpolating, thus derived from the nature of logarithms, and so commodious for their computation, might likewise be deduced from general considerations. Let A, B, C, D, E, &c. represent any series of numbers. If they advance regularly and slowly, their first differences, B — A, C — B, D — C, E — D, &c. may be viewed as constituting an arithmetical progression. Wherefore the sum of the extremes will be equal to that of the mean terms, or $(E - D) + (B - A) = (D - C) + (C - B)$, that is, $E - A = 2D - 2B$, and therefore $D - B = \frac{E - A}{2}$, whence $D = B + \frac{E - A}{2}$. Applying this to the logarithms of eight places of figures, let A, B, C, D, E, &c. represent the logarithms of 500, 501, 502, 503, 504, &c. then $\log. 503 = \log. 501 + \frac{\log. \cdot 504 - \log. 500}{2} = \log. 501 + \frac{\log. 252 - \log. 250}{2} = 2{\cdot}69983773 + \frac{1}{2}(2{\cdot}40140054 - 2{\cdot}39794001) = 2{\cdot}79156799$; the halves of the differences of the alternate logarithms of 250, 251, 252, 253, &c. being thus taken, as before, to compose by their additions the logarithms of the odd numbers 503, 505, 507, &c.

But since $E - A = 2D - 2B$, it follows that $E = A + 2(D - B)$. Wherefore, in any series, the fifth term will be found nearly, by adding to the first term twice the difference between the second and fourth terms. In this way the tables of natural sines, tangents, and secants, could easily be framed. Thus, the logarithmic sines of the successive arcs, 50°, 50° 1′, 50° 2′, and 50° 3′ being given from Vlacq's *Tables*, to find the logarithmic sine of 50° 4′.

Arcs.	Logarithmic Sines.	
50° 0′	9·8842539665	
1′	9·8843599396	2117585
2′	9·8844658502	2
3′	9·8845716981	4235170
4′	9·8846774835	

Here, passing over the middle term, the difference between the logarithmic sines of 50° 1′ and of 50° 3′ is doubled, and added to that of 50°, to form the logarithmic sine of 50° 4′.

But a nearer approximation may be obtained, by supposing the second differences of any series to form the arithmetical progression. The sum of the extreme terms $C - 2B + A$ and $F - 2E + D$ would, therefore, be equal to the sum of the mean terms $D - 2C + B$ and $E - 2D + C$; whence $F - A = 3B + 3E - 2C - 2D$, or $F = A + 3(B + E) - 2(C + D)$. Thus, the natural sines of the successive arcs 30, 31, 32, 34, and 35 degrees may be easily computed to seven places of figures.

Arcs.	Sines.	
30°	·5000000	
31	·5150381	1·0742310 × 3 = 3·2226930
32	·5299193	1·0745583 × 2 = 2·1491166
33	·5446390	
34	·5592929	Difference 1·0735764
35	·5735764	

The sines of 31° and of 34° are here added together, and the sum tripled, and from this amount is taken twice the sum of the sines of 31° and of 33°; the sine of 30° being subtracted from that remainder, leaves finally the sine of 35°.

Employing the same number of terms of the series, a still closer approximation may be discovered, by considering the third differences only as uniformly progressive. Wherefore the extreme differences $D - 3C + 3B - A$ and $F - 3E + 3D - C$ will be together equal to double the middle one, $E - 3D + 3C - B$, and consequently $F - A = 5E - 10D + 10C - 5B$, or $F = A + 5(E - B) - 10(D - C)$.

Hence the logarithms even of low numbers may be computed exact to eight decimal places. Thus, the logarithms of 150, 151, 152, 153, and 154, being given, that of 155 is found by this process:

Numbers.	Logarithms.	
150	2·17609126	
151	2·17897695	854377 × 5 = 4271885
152	2·18189359	284784 × 10 = 2847840
153	2·18469143	
154	2·18752072	Difference, 1424045
155	2·19033170	Add, 2·17609126
		2·19033171

The difference between the logarithms of 151 and 154 is here multiplied by 5, and the difference of the logarithms of 152 and 153 is multiplied by 10; and the excess of the former product above the latter being added to the logarithm of 150, gives the logarithm of 155.

It would obviously be preferable, however, to employ the formula in a modified form for interpolation merely. Hence $D = C + \frac{1}{2}(E - B) + A - F$.

If six terms of the series were given, the seventh could be found to a high degree of accuracy. The sum of the extremes of the progressive third differences being now assumed equal to that of the means, we have $D - 3C + 3B - A + G - 3F + 3E - D = E - 3D + 3C - B + F - 3E + 3D - C$, and by reduction $G - A = 4F - 5E - 5C - 4B$, whence $G = A + 4(F - B) - 5(E - C)$. It seems unnecessary to subjoin any further illustrations; but the very simple methods of interpolation now proposed might be applied with great facility and advantage in various physical researches. In this way much light may be thrown upon the resistance of fluids, and upon the force, the density, and the component heat of steam, at different temperatures.

LOGIC.

Logic is the art of properly conducting reason in the knowledge of things, whether for instructing ourselves or others; or it may be defined the science of human thought, inasmuch as it traces the progress of knowledge, from the first and most simple notions, through all the different combinations of these, and the numerous deductions which result from variously comparing them one with another.

The business of logic, therefore, is to evolve the laws of human thought, and the proper manner of conducting the reason, in order to the attainment of truth and knowledge. It lays open those errors and mistakes which we are apt, through inattention, to run into; and teaches us how to distinguish between truth, and what only wears the resemblance thereof. By these means we become acquainted with the nature, limits, and force of the understanding, and see what things lie within its reach; where we may attain certainty and demonstration; and when we must be contented with probability.

This science is generally divided into four parts, namely, *Perception*, *Judgment*, *Reasoning*, and *Method*.

I.—OF PERCEPTION.

We find ourselves surrounded with a variety of objects, which, acting differently upon our senses, convey different impressions into the mind, and thereby rouse the attention and notice of the understanding. By reflecting, too, on what passes within us, we become sensible of the operations of our own minds, and attend to them as a new set of impressions. But in all this there is only bare *consciousness*. The mind, without proceeding any further, takes notice of the impressions which are made upon it, and views things in order, as they present themselves one after another. This attention of the understanding to the objects acting upon it, whereby it becomes sensible of the impressions they make, is called by logicians *perception*; and the notices themselves, as they exist in the mind, and are there treasured up to become the materials of thinking and knowledge, are distinguished by the names of *ideas, notions, thoughts*, &c. In the article METAPHYSICS it will be shown at large, how the mind, being furnished with ideas, contrives to diversify and enlarge its stock; we have here chiefly to consider the means of making known our thoughts to others, that we may not only understand how knowledge is acquired, but also in what manner it may be communicated with the greatest certainty and advantage.

1. *Of Words, considered as the Signs of Ideas.*

Words the means of recording thoughts.

1. The ideas of which we are conscious, though manifold and various, are nevertheless of themselves unknown to others. But God, designing us for society, has provided us with organs fitted to frame articulate sounds, and given us also a capacity of using those sounds as the signs of internal conceptions. Hence spring words and language; for, having once pitched upon any sound to stand as the mark or sign of an idea in the mind, custom by degrees establishes such a connection between them, that the appearance of the idea in the understanding suggests to our remembrance the sound or name by which it is expressed; as, in like manner, the hearing of the sound excites the idea which it represents. And thus it is easy to conceive how a man may record his own thoughts, and bring them again into view in any succeeding period of life; for this connection being once settled, as the same sounds will always serve to excite the same ideas, if he can but contrive to register his words in the order and disposition in which the actual train of his thoughts presents itself to his imagination, it is evident that he will be able to recall these thoughts at pleasure, and that too in the very manner of their first appearance. Accordingly we find, that the inventions of writing and printing, by enabling us to fix and perpetuate such perishable things as sounds, have also furnished us with the means of giving a kind of permanence to the transactions of the mind, insomuch that they may thereby be subjected to our review like any other objects of nature.

Communication of knowledge.

2. But besides the capacity of recording our thoughts, external signs also enable us to communicate our thoughts to *others*, and to receive information of what passes in *their* minds. For any number of men, having agreed to establish the same sounds as signs of the same ideas, it is apparent that the repetition of these sounds must suggest similar ideas in each, and thus tend to create a perfect correspondence of thoughts. When, for instance, any train of ideas succeed one another in the mind, if the names by which we are wont to express them have been annexed by those with whom we converse to the same order of ideas, nothing is more evident, than that, by repeating those names according to the tenor of our actual conceptions, we shall raise in their minds a similar train of thought. For, by barely attending to what passes within themselves upon hearing the sounds which we repeat, they will also be made aware of the ideas in our understanding. So that we here clearly perceive how a man may communicate his sentiments, knowledge, and discoveries to others, if the language in which he converses be extensive enough to mark all the ideas and operations of his mind. But as this is not always the case, and men are often obliged to invent terms of their own to express new views and conceptions of things, it may be asked, how, in these circumstances, we can become acquainted with the thoughts of another, when he makes use of words with which we have never associated ideas? In order to unveil this mystery, and afford some insight into the foundation, progress, and improvement of language, the following observations are deserving of attention.

Simple ideas.

3. First, it is evident that no word can be to any man the sign of an idea, unless that idea comes to have a real existence in his mind. For names, being only so far intelligible as they denote known internal conceptions; where they have none such answering to them, they are plainly sounds without signification, and of course they convey no instruction or knowledge. But no sooner are the ideas to which they belong raised in the understanding, than, finding it easy to connect them with the established names, we can join in any agreement of this kind established by others, and thereby enjoy the benefit of their discoveries. The first thing therefore to be considered is, how these ideas may be conveyed into the mind; that being there, we may learn to connect them with their appropriate sounds, and so become capable of understanding others when they make use of these sounds in communicating their thoughts. Now, to comprehend this distinctly, it is necessary to attend to the division of our ideas into *simple* and *complex* (see METAPHYSICS). And, firstly, as to our simple ideas, they can find no admission into the mind, except by the two original portals of knowledge, *sensation* and *reflection*. If therefore any of these have as yet no being in the understanding, it is impossible by words or description to excite them there. A man who had never felt the sensation of *heat*, could not be brought to comprehend that sensation by any thing which we might say to explain it. If we would really produce the idea in him, it must be by applying the proper object to his senses, and bringing him within the influence of a heated body. When this is done, and experience has taught him the sensation to which men have annexed the name of *heat*, it then becomes to him the sign of that idea, and he thenceforth understands the meaning of the term, which, before, all the words in the world would not have been sufficient to convey into his mind. The case is the same in respect of light and colours. A man born blind, and thereby deprived of the only means of acquiring the ideas of this class, can never be brought to understand the names by which they are expressed. The reason is obvious. They stand for ideas which have no existence in his mind; and as the organ appropriated to their reception is wanting, all other contrivances are vain, nor can they by any description be suggested to his imagination. But it is quite otherwise in the case of complex notions; for these being no more than certain combinations of simple ideas, put together in various forms, if the original ideas out of which the combinations are made have already obtained admission into the understanding, and the names serving to express them are known, it will be easy, by enumerating the several ideas concerned in the composition, and marking the order and manner in which they are united, to raise any complex conception in the mind. Thus the idea answering to the word *rainbow* may be readily excited in the imagination of another who has never seen the appearance itself, by barely describing the figure, size, position, and order of colours, if we suppose that these several simple ideas, with their names, are sufficiently known to him.

Names of complex ideas definable.

4. And this leads to a second observation upon this subject, namely, that words standing for complex ideas are all *definable*, whereas those by which we denote simple ideas are not; for simple ideas being a sort of secondary perceptions, which have no other entrance into the mind than by sensation or reflection, can only be obtained by experience, from the several objects of nature which are proper to produce in us those perceptions. Words indeed may very well serve to remind us of them, if they have already found admission into the understanding, and their connection with the established names be known; but they can never give them their original being and existence there. And hence it is, that when any one asks the meaning of a word denoting a simple idea, we pretend not to explain it to him by a definition, well knowing that to be impossible; but,

supposing him already acquainted with the idea, and only ignorant of the name by which it is called, we either mention it to him by some other name with which we presume he knows its connection, or appeal to the object from which the idea itself is derived. Thus, were any one to ask the meaning of the word *white*, we should tell him it stood for the same idea as *albus* in Latin, or *blanc* in French; or, if we thought him a stranger to these languages, we might appeal to an object producing the idea, by saying that it denotes the colour which we observe in *snow* or *milk*. But this is by no means a definition of the word, exciting a new idea in his understanding; it is merely a contrivance to remind him of a known idea, and teach him its connection with the established name. For if the ideas after which he inquires have never yet been raised in his mind, as suppose one who had seen no other colours than *black* and *white*, should ask the meaning of the word *scarlet*, it is easy to perceive, that it would be no more possible to make him comprehend it by words, or by a definition, than to introduce the same perception into the imagination of a man born blind. The only method in this case is, to present some object, by looking at which the perception itself may be excited; and thus he will learn both the name and the idea together.

xperi-nce and bserva-on.

5. But how comes it to pass that men agree in the names of their simple ideas, seeing they cannot ascertain the perceptions in one another's minds, nor by words make known these perceptions to others? The effect is produced by experience and observation. Thus finding, for instance, that the name of *heat* is annexed to that sensation which men feel when they approach the fire, we make it also the sign of the sensation excited in us by such an approach, nor have we any doubt that it denotes the same perception in our mind as in theirs. For we are naturally led to imagine, that the same objects operate alike upon the organs of the human body, and produce an uniformity of sensations. No man fancies that the idea raised in him by the taste of *sugar*, and which he calls *sweetness*, differs from that excited in another by the same object; or that *wormwood*, to the relish of which he has applied the epithet *bitter*, produces in another the sensation which he denotes by the word *sweet*. Presuming therefore upon this conformity of perceptions, when they arise from the same objects, we easily agree as to the names of our simple ideas; and if at any time, by a more narrow scrutiny into things, new ideas of this class should come in our way, which we may chuse to express by terms of our own invention, these names are explained, not by a definition, but by referring to the objects whence the ideas themselves have been obtained.

onvey-nce of mplex eas by finitions.

6. Being in this manner furnished with simple ideas, and the names by which they are expressed, the meaning of the terms which stand for complex ideas is easily got at, because the ideas themselves answering to these terms may be conveyed into the mind by definitions; for our complex notions are only certain combinations of simple ideas. When, therefore, these are enumerated, and the manner in which they are united into one conception explained, nothing more is wanting to raise that conception in the understanding; and thus the term denoting it comes of course to be understood. But here it is worth while to reflect a little upon the wise contrivance of nature, in thus furnishing us with the aptest means of communicating our thoughts to others. For were it not so ordered, that we could thus by definitions convey our complex ideas from one to another, it would in many cases be impossible to make them known at all. This is apparent in those ideas which are the proper work of the mind itself; for as they exist only in the understanding, and have no real objects in nature in conformity to which they are framed, if we could not make them known by description, they would for ever lie hid within our own breasts, and be confined to the narrow acquaintance of a single mind. All the fine scenes which arise from time to time in the poet's fancy, and by his lively painting give such entertainment to his readers, were he destitute of this faculty of laying them open to the view of others by words and description, could not extend their influence beyond his own imagination, or give pleasure to any one but the original inventor.

Of great avail towards improving knowledge.

7. There is this further advantage in the ability we enjoy of communicating our complex notions by definitions, that as these constitute by far the largest class of our ideas, and most frequently occur in the progress and improvement of knowledge, so they are by this means imparted with the greatest readiness, than which nothing can tend more to the increase and diffusion of science; for a definition is soon pursued, and if the terms of it are well understood, the idea itself finds an easy admission into the mind. But, in simple perceptions, where we are referred to the objects producing them, if these cannot be come at, as is sometimes the case, the names by which they are expressed must remain empty sounds. As new ideas of this class, however, occur but rarely in the sciences, they seldom create any great obstruction. Yet it is otherwise with our complex notions; for, every step we take leading us into new combinations and views of things, it becomes necessary to explain these to others, before they can be made acquainted with our discoveries; and as the manner of definitions is easy, requiring no apparatus but that of words, which are always ready at hand, we can hence with less difficulty remove such obstacles as might arise from terms of our own invention, when these are made to stand for new complex ideas suggested to the mind by some actual train of thinking. And thus at last we are let into the mystery hinted at in the beginning of this chapter, viz. how we may become acquainted with the thoughts of another, when he makes use of words to which we have as yet joined no ideas. From what has already been said, the answer is obvious. If the terms denote simple perceptions, he must refer us to those objects of nature whence the perceptions themselves are to be obtained; but if they stand for complex ideas, their meaning may be explained by a *definition*.

2. *Of Definition.*

Definition defined.

1. A DEFINITION *is the development and determination of some conception of the mind, answering to the word or term made use of as its sign.* Now as, in exhibiting any idea to another, it is necessary that the description be such as may excite that precise idea in his mind, it is plain that definitions, properly speaking, are not arbitrary, but confined to the representing of certain determinate settled notions, such, namely, as are annexed by the speaker or writer to the words he employs. As nevertheless it is universally allowed that the signification of words is perfectly voluntary, and not the effect of any natural and necessary connection between them and the ideas for which they stand, some may perhaps wonder why definitions are not so likewise. In order, therefore, to unravel this difficulty, and show distinctly what is and what is not arbitrary in speech, we must carefully distinguish between the connection of our words and ideas, and the unfolding of the ideas themselves.

Connection between words and ideas.

2. First, as to the connection of words and ideas; this, it is evident, is purely an arbitrary institution. When, for instance, we have in our minds the idea of any particular species of metals, the calling it by the name *gold* is an effect of the voluntary choice of men speaking the same language, and not of any peculiar aptness in that sound to express that idea. Other nations we find make use of different sounds, and with the same effect. Thus

aurum denotes the same idea in Latin, and *or* in French; and even the word *gold* itself would have as well served to express the idea of that metal which we call *silver*, had custom in the beginning so established it.

Ideas limited to representing the appearance by which they are distinguished.

3. But although we are thus entirely at liberty to connect any idea with any sound, yet it is quite otherwise in unfolding the ideas themselves; for every idea having a precise appearance of its own, by which it is distinguished from every other idea, it is manifest, that in laying it open to others, we must study such a description as shall exhibit that peculiar appearance. When we have formed to ourselves the idea of a figure bounded by four equal sides, joined together at right angles, we are at liberty to express that idea by any sound, and call it either a *square* or a *triangle.* But whichever of these names we use, so long as the idea is the same, the description by which we would signify it to another must likewise remain so. Let it be called *square* or *triangle*, it is still a figure having four equal sides, and all its angles right ones. Hence we clearly see what is and what is not arbitrary in the use of words. The establishing any sound as the mark of some determinate idea in the mind, is the effect of free choice, and of a voluntary combination amongst men; and as different nations make use of different sounds to denote the same ideas, hence proceed all that variety of languages which we meet with in the world. But when a connection between our ideas and words is once settled, the unfolding of the idea answering to any word, which properly constitutes a definition, is by no means an arbitrary thing. In this case we are bound to exhibit the precise conception which either the use of language, or our own particular choice, has annexed to the term we employ.

Causes of obscurity. Verbal definitions.

4. And thus it appears, that definitions, considered as descriptions of ideas in the mind, are steady and invariable, being confined to the representation of those precise ideas. But then, in the application of definitions to particular names, we are altogether left to our own free choice; because, as the connecting of any idea with any sound is a perfectly arbitrary institution, the applying the description of that idea to that sound must be so likewise. When, therefore, logicians tell us that the definition of the name is arbitrary, they mean no more than this, That as different ideas may be connected with any term, according to the pleasure of him who employs it, in like manner may different descriptions be applied to the term, suitable to the ideas so connected. But this connection being settled, and the term considered as the sign of some fixed idea in the understanding, we are no longer left to arbitrary explanations, but must study such a description as corresponds with that precise idea. Now, this alone, according to what has been before laid down, ought to be accounted a definition. What seems to have occasioned no small confusion in this matter, is, that many explanations of words, where no idea is unfolded, but the connection between some word and idea is merely asserted, have yet been dignified with the name of definitions. Thus, when we say that *a clock is an instrument by which we measure time*, that is by some called a definition; and yet it is plain that we are beforehand supposed to have an idea of this instrument, and only taught that the word *clock* serves in common language to denote that idea. By this rule all explanations of words in our dictionaries would be definitions, nay, the names of even simple ideas might be thus described. *White*, we may say, is the colour we observe in snow or milk; *heat*, the sensation produced by approaching the fire; and so in innumerable other instances. But these, and all others of a similar kind, are by no means definitions, exciting new ideas in the understanding, but merely contrivances to remind us of known ideas, and to teach their connection with the established names.

Complex ideas alone capable of definition. Real definitions.

5. But, in definitions properly so called, we have first to consider the term we use as the sign of some inward conception, either annexed to it by custom, or by our own free choice; and then the business of the definition is to unfold and explicate that idea. As therefore the whole art consists in giving just and true copies of our ideas, a definition is said to be made perfect, when it serves distinctly to excite the idea described in the mind of another, even supposing him to have been previously unacquainted with it. This point being settled, then, let us next inquire what those ideas are which are capable of being thus unfolded. And, in the first place, it is evident that all our simple ideas are necessarily excluded. We have already seen that experience alone is to be consulted here, insomuch that if either the objects whence they are derived come not in our way, or the avenues appointed by nature for their reception are wanting, no description can be sufficient to convey them into the mind. But where the understanding is already supplied with these original and primitive conceptions, as they may be united together in an infinity of different forms, so may all their several combinations be distinctly laid open, by enumerating the simple ideas concerned in the various combinations, and tracing the order and manner in which they are linked together in composition. Now these combinations of simple notices constitute what we call complex notions; whence it is evident, that complex ideas, and these alone, admit of that kind of description which goes by the name of definition.

6. Definitions, then, are pictures or representations of our ideas; and as these representations are only possible when the ideas themselves are complex, it is obvious to remark, that definitions cannot have place, except where we make use of terms standing for such complex ideas. But our complex ideas being, as we have said, nothing more than different combinations of simple ideas, we know and comprehend them perfectly, when we know the several simple ideas of which they consist, and can so put them together in our minds as may be necessary towards the framing of that peculiar connection which gives every idea its distinct and proper appearance.

Things required in a definition.

7. Two things are therefore required in every definition. The first is, that all the original ideas, out of which the complex one is formed, be distinctly enumerated; and the second is, that the order and manner of combining them into one conception be clearly explained. Where a definition has these requisites, nothing is wanting to its perfection; because every one who reads it and understands the terms, seeing at once what ideas he is to join together, and also in what manner, can at pleasure form in his own mind the complex conception answering to the term defined. Let us, for instance, suppose the word *square* to stand for that idea by which we represent to ourselves a figure whose sides subtend quadrants of a circumscribed circle. The parts of this idea are the sides bounding the figure. These must be four in number, and all equal amongst themselves, because they are each to subtend a fourth part of the same circle. But, besides these component parts, we must also take notice of the manner of putting them together, if we would exhibit the precise idea for which the word *square* here stands; for, four equal right lines, anyhow joined, will not subtend quadrants of a circumscribed circle. A figure with this property must have its sides standing also at right angles. Taking in this last consideration, therefore, respecting the manner of combining the parts, the idea is fully described, and the definition thereby rendered complete; for a figure bounded by four equal sides, joined together at right angles, has the property required, and is moreover the only right-lined figure to which that property belongs.

How to arrive at just definitions.

8. It will now be obvious to every one in what manner we ought to proceed, in order to arrive at just and adequate definitions. First, we are to take an exact view of

the idea to be described; trace it to its original principles; and mark the several simple perceptions which enter into the composition of it. Secondly, we are to consider the particular manner in which these elementary ideas are combined, in order to form that precise conception for which the term we make use of stands. When this is done, and the idea is wholly unravelled, we have nothing more to do than fairly to transcribe the appearance it makes to our own minds. Such a description, by distinctly exhibiting the order and number of our primitive conceptions, cannot fail to excite, at the same time, in the mind of every one who reads it, the complex idea resulting from them; and therefore it attains the true and proper end of a definition.

3. *Of the Composition and Resolutions of our Ideas, and the Rules of Definition thence arising.*

rocedure com- ounding eas.

1. The rule laid down in the foregoing chapter is general, extending to all possible cases, and is indeed that to which alone we can have recourse where any doubt or difficulty may arise. It is not, however, necessary that we should practise it in every particular instance. Many of our ideas are extremely complicated, insomuch that to enumerate all the simple perceptions out of which they are formed would be a very troublesome and tedious task. For this reason logicians have established certain compendious rules of defining, which it may not be amiss here to give some account of. But in order to the better understanding of what follows, it will be necessary to keep in view, that there is a certain gradation in the composition of our ideas. The mind of man is very limited in its apprehension, and cannot take in a great number of objects at once. We are therefore obliged to proceed gradually, and make our first advances subservient to those which follow. Thus, in forming our complex notions, we begin at first with but a few simple ideas, such as we can manage with ease, and unite together into one conception. When we are provided with a sufficient stock of these, and have by habit and use rendered them familiar to our minds, they become the component parts of other ideas still more complicated, and form what may be called a second order of compound notions. This process, it is evident, may be continued to any degree of composition we please, mounting from one stage to another, and enlarging, as we ascend, the number of combinations.

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2. But, in a series of this kind, whosoever would make himself perfectly acquainted with the last and highest order of ideas, must find it expedient to proceed gradually through all the intermediate steps. For, were he to take any very composite idea to pieces, and, without regard to the several classes of simple perceptions which have already been formed into distinct combinations, break it down at once into its original elements, the number would be so great as perfectly to confound the imagination, and overcome the utmost reach and capacity of the mind. When we observe a prodigious multitude of men huddled together in crowds, without order or any regular position, we find it impossible to arrive at an exact knowledge of their number. But if they are formed into separate battalions, and so stationed as to fall within the leisurely survey of the eye, by viewing them successively and in order, we may come to an easy and certain determination. It is the same in regard to complex ideas. When the original perceptions out of which they are framed are very numerous, it is not enough that we take a view of them in loose and scattered bodies; we must form them into distinct classes, and unite these classes in a just and orderly manner, before we can arrive at a true knowledge of the compound notions resulting from them.

Definitions should keep pace with ideas.

3. This gradual progress of the mind to its composite notions, through a variety of intermediate steps, plainly points out the manner of conducting the definitions by which these notions may be conveyed into the minds of others; for, as the series commences with simple and easy combinations, and advances through a succession of different orders, rising one above another in the degree of composition, it is evident that, in a train of definitions expressing these ideas, a similar gradation is to be observed. Thus the complex ideas of the lowest order can no otherwise be described than by enumerating the simple ideas out of which they are formed, and explaining the manner of their union. But, in the second, or any other succeeding order, as they are formed out of those gradual combinations, it is not necessary, in describing them, to mention one by one all the simple ideas of which they are composed. They may be more distinctly and briefly unfolded by enumerating the compound ideas of a lower order, of whose union they are the result, and which are all supposed to be already known in consequence of previous definitions. Here then it is that the logical method of definition takes place; which, that it may be the better understood, we shall explain somewhat more particularly the several steps and gradations of the mind in compounding its ideas, and thence deduce that peculiar form of definition which logicians have thought proper to establish.

Procedure from particular to general ideas.

4. All the ideas we receive from the several objects of nature that surround us represent distinct individuals; and these individuals, when compared together, are found in certain particulars to resemble each other. Hence, by collecting the resembling particulars into one conception, we form the notion of a *species*. And here let it be observed, that this last idea is less complicated than that by which we represent any of the particular objects contained under it; for the idea of the species excludes the peculiarities of the several individuals, and embraces such properties only as are common to all. Again, by comparing several species together, and observing their resemblance, we form the idea of a *genus;* where, in the same manner as before, the composition is lessened, because we leave out what is peculiar to the several species compared, and retain only the particulars in which they agree. It is easy to conceive the mind proceeding thus from one step to another, and advancing through several classes of general notions, until at last it arrives at the highest genus of all, denoted by the word *being*, where the idea of existence alone is concerned.

Conduct of the mind in compounding its ideas.

5. In this procedure we observe the mind unravelling a complex idea, and tracing it in the ascending scale, from greater or less degrees of composition, until it terminates in one simple perception. But if we take the series the contrary way, and, beginning with the last or highest genus, carry our view downwards, through all the inferior genera and species, to the individuals, we shall thereby arrive at a distinct apprehension of the conduct of the understanding in the composition of its ideas; for, in the several classes of our perceptions, the highest in the scale is for the most part that which is made up of but a few simple ideas, such as the mind can take in and survey with ease. This first general notion, when branched out into the different subdivisions contained under it, has in every one of them something peculiar, by which they are distinguished amongst themselves; insomuch that, in descending from the genus to the species, we always superadd some new idea, and thereby increase the degree of composition. Thus the idea denoted by the word *figure* is of a very general nature, and composed of but few simple perceptions, as implying no more than space everywhere bounded. But if we descend further, and consider the boundaries of this space, as that they may be either lines or surface, we shall fall into the several species of figure. For where the space is bounded by one or more surfaces, we

mutable truths. If it be true that the whole is equal to all its parts, it must be so unchangeably; because the relation of equality, being attached to the ideas themselves, must ever intervene where the same ideas are compared. Of this nature are all the truths of natural religion, morality, and mathematics, and, in general, whatever may be gathered from the bare view and consideration of our ideas.

2. Experience.

4. The second ground of human judgment is Experience; from which we are led to infer the existence of those objects that surround us, and fall under the immediate notice of our senses. When we see the sun, or cast our eyes towards a building, we not only have perceptions of these objects within ourselves, but ascribe to them a real existence independent of the percipient mind. It is also by the information of the senses that we judge of the qualities of bodies; as when we say that "snow is white, fire hot, or steel hard." For as we are wholly unacquainted with the internal structure and constitution of the bodies which produce these sensations in us, and are unable to trace any connection between that structure and the sensations themselves, it is evident that we build our judgments altogether upon observation, ascribing to bodies such qualities as are answerable to the perceptions which they excite in us. Not that we ever suppose the qualities of bodies to be things of the same nature with our perceptions; for there is nothing in fire similar to the sensation of heat, or in a sword similar to that of pain; but when different bodies excite in our minds similar perceptions, we necessarily ascribe to these bodies, not only an existence independent of us, but likewise similar qualities, of which it is the nature to produce similar perceptions in the human mind. But this is not the only advantage derived from experience; for to that too we are indebted for all our knowledge regarding the co-existence of sensible qualities in objects, and the operations of bodies one upon another. Ivory, for instance, is hard and elastic; this we know by experience, and indeed by experience alone. For, being altogether strangers to the true nature both of elasticity and hardness, we cannot by the bare contemplation of our ideas determine how far the one necessarily implies the other, or whether there may not be a repugnance between them. But when we observe that both exist in the same object, we are then assured from experience that they are not incompatible; and when we also find that a stone is hard and not elastic, and that air though elastic is not hard, we likewise conclude upon the same foundation that the ideas are not necessarily conjoined, but may exist separately in different objects. In like manner, with regard to the operations of bodies upon one another, it is evident that our knowledge this way is all derived from observation. *Aqua regia* dissolves gold, as has been found by frequent trial, nor is there any other way of arriving at the discovery. Naturalists may tell us, if they please, that the parts of *aqua regia* are of a texture apt to insinuate between the corpuscles of gold, and thereby loosen and burst them asunder. If this be a true account of the matter, it will notwithstanding be allowed that our conjecture in regard to the conformation of these bodies is deduced from the experiment, and not the experiment from the conjecture. It was not from any previous knowledge of the intimate structure of *aqua regia* and *gold*, and the aptness of their parts to act or to be acted upon, that we came by the conclusion above mentioned. The internal constitution of bodies is in a manner wholly unknown to us; and could we even surmount this difficulty, yet, as the separation of the parts of gold implies something like an active force in the *menstruum*, and we are unable to conceive how the latter comes to be possessed of this activity, the effect must be owned to be altogether beyond our comprehension. But when repeated trials had once confirmed it, insomuch that it was admitted as an established truth in natural knowledge, it then became easy for men to spin out theories of their own invention, and contrive such a structure of parts, both for *gold* and *aqua regia*, as would best serve to explain the phenomenon upon the principles of that system of philosophy, whatever it might be, which they had adopted.

5. From what has been said, it is evident that as intuition is the foundation of what we call *scientific*, so experience is the foundation of what we call *natural* knowledge. For this last being wholly concerned with objects of sense, or those bodies that constitute the natural world, and their properties, as far as we can discover them, being to be traced only by a long and painful series of observations, it is apparent, that, in order to improve this branch of knowledge, we must betake ourselves to the method of trial and experiment.

6. But though experience is what we may term the immediate foundation of natural knowledge, yet with respect to particular persons its influence is very narrow and confined. The bodies that surround us are numerous, many of them lie at a great distance, and some are quite beyond our reach. Life is so short, and so crowded with cares, that but little time is left for any single man to employ himself in unfolding the mysteries of nature. Hence it is necessary to admit many things upon the testimony of others, which by this means becomes the foundation of a great part of our knowledge of body. No man doubts of the power of *aqua regia* to dissolve gold, though perhaps he never himself made the experiment. In these, therefore, and such like cases, we judge of the facts and operations of nature upon the mere ground of testimony. However, as we can always have recourse to experiment where any doubt or scruple arises, this is justly considered as the true foundation of natural philosophy, being indeed the ultimate support upon which our assent rests, and to which we appeal when the highest degree of evidence is required.

7. But there are many facts which do not admit of an appeal to the senses; and in this case testimony is the true and only foundation of our judgments. All human actions, of whatever kind, when considered as already past, are of the nature here described; because having now no longer any existence, both the facts themselves, and the circumstances attending them, can be known only from the relations of those who had sufficient opportunities of arriving at the truth. *Testimony*, therefore, is justly accounted a third ground of human judgment; and as from the other two we have deduced *scientific* and *natural* knowledge, so we may from this derive *historical*, by which we mean, not merely a knowledge of the civil transactions of states and kingdoms, but of all facts whatsoever, where testimony is the ultimate foundation of our belief.

2. *Of Affirmative and Negative Propositions.*

1. Whilst the comparing of our ideas is considered merely as an act of the mind, assembling them together, and joining or disjoining them according to the result of its perceptions, we call it *judgment;* but when our judgments are put into words, they then bear the name of *propositions*. A proposition, therefore, is a sentence expressing some judgment of the mind, by which two or more ideas are affirmed to agree or disagree. Now, as our judgments include at least two ideas, one of which is affirmed or denied of the other, so must a proposition have terms answering to these ideas. The idea of which we affirm or deny, and of course the term expressing that idea, is called the *subject* of the proposition. The idea affirmed or denied, as also the term answering it, is called the *predicate*. Thus, in the proposition, "God is omnipotent," *God* is the subject, it being of him that we affirm omnipotence, and *om-*

Judgment.

nipotent is the predicate, because we affirm that the idea expressed by that word belongs to God.

The copu-la.

2. But as in propositions ideas are either joined or disjoined, it is not enough to have terms expressing those ideas, unless we have also some words to denote their agreement or disagreement. That word in a proposition which connects two ideas together, is called the *copula;* and if a negative particle be annexed, we thereby understand that the ideas are disjoined. The *substantive verb* is commonly made use of for the copula, as in the above-mentioned proposition, "God is omnipotent," where *is* represents the copula, and signifies the agreement of the ideas of *God* and *omnipotence.* But if we mean to separate two ideas, then, besides the substantive verb, we must also use some particle of negation to express this repugnance. The proposition, "Man is not perfect," may serve as an example of this kind; for here the notion of *perfection* being removed from the idea of *man,* the negative particle *not* is inserted after the copula, to signify the disagreement between the subject and the predicate.

3. Every proposition necessarily consists of these three parts, but then it is not alike needful that they be all severally expressed in words; because the copula is often included in the term of the predicate, as when we say "He sits," which imports the same as "He is sitting." In the Latin language a single word has often the force of a whole sentence. Thus *ambulat* is the same as *ille est ambulans; amo,* as *ego sum amans;* and so in innumerable other instances, by which it appears that we are not so much to regard the number of words in a sentence, as the ideas which they represent, and the manner in which they are put together. For wherever two ideas are joined or disjoined in an expression, though of but a single word, it is evident that we have a subject, predicate, and copula, and of consequence a complete proposition.

4. When the mind joins two ideas, we call it an *affirmative* judgment; when it separates them, a *negative;* and as any two ideas compared together must necessarily either agree or not agree, it is evident that all our judgments fall under these two divisions. Hence, likewise, the propositions expressing these judgments are all either affirmative or negative. An affirmative proposition connects the predicate with the subject, as, "A stone is heavy;" a negative proposition separates them, as "God is not the author of evil." *Affirmation,* therefore, is the same as joining two ideas together; and this is effected by means of the copula. *Negation,* on the contrary, marks the repugnance between the ideas compared, in which case a negative particle must be called in to show that the connection included in the copula does not take place.

5. Hence we see the reason of the rule commonly laid down by logicians, That in all negative propositions the negation ought to affect the copula. For as the copula, when placed by itself between the subject and the predicate, manifestly binds them together, it is evident, that in order to render a proposition negative, the particles of negation must enter it in such a manner as to destroy this union. In a word, two ideas are only disjoined in a proposition when the negative particle may be so referred to the copula as to break the affirmation included in it, and undo that connection it would otherwise establish. When we say, for instance, "No man is perfect," take away the negation, and the copula of itself plainly unites the ideas in the proposition. But as this is the very reverse of what is intended, a negative mark is added, to show that this union does not take place here. The negation, therefore, by destroying the effect of the copula, changes the very nature of the proposition, insomuch that, instead of binding two ideas together, it denotes their separation. On the contrary, in this sentence, "The man who departs not from an upright behaviour is beloved of God," the predicate *beloved of God* is evidently affirmed of the subject an *upright man;* so that, notwithstanding the negative particle, the proposition is still affirmative. The reason is plain. The negation here affects not the copula, but, constituting properly a part of the subject, serves, with other terms in the sentence, to form one complex idea, of which the predicate *beloved of God* is directly affirmed.

3. *Of Universal and Particular Propositions.*

Division of propositions.

1. The next considerable division of propositions is that into *universal* and *particular.* Our ideas, according to what has been already observed, are all singular as they enter the mind, and represent individual objects. But as by abstraction we can render them universal, so as to comprehend a whole class of things, and sometimes several classes at once, hence the terms expressing these ideas must be in like manner universal. If, therefore, we suppose any general term to become the subject of a proposition, it is evident, that whatever is affirmed of the abstract idea belonging to that term, may be affirmed of all the individuals to which that idea extends. Thus, when we say, "Men are mortal," we consider mortality, not as confined to one or any number of particular men, but as what may be affirmed without restriction of the whole species. By this means the proposition becomes as general as the idea which forms the subject of it, and indeed derives its universality entirely from that idea, being more or less so according as this may be extended to more or fewer individuals. But it is further to be observed of these general terms, that they sometimes enter a proposition in their full latitude, as in the example above given, and sometimes appear with a mark of limitation. In this last case we are given to understand that the predicate agrees not to the whole universal idea, but only to a part of it; as in the proposition, "Some men are wise." Here wisdom is not affirmed of every particular man, but is restricted to a few of the human species.[1]

Propositions are universal where the subject is so.

2. Now, from this different appearance of the general idea which constitutes the subject of any judgment, arises the division of propositions into *universal* and *particular.* An universal proposition is that in which the subject is some general term taken in its full latitude, insomuch that the predicate agrees to all the individuals comprehended under it if it denotes a proper species, and to all the several species and their individuals if it marks an idea of a higher order. The words *all, every, no, none,* &c. are the proper signs of this universality; and as they seldom fail to accompany general truths, so they form the most obvious criterion by which to distinguish them. "All animals have a power of beginning motion." This is an universal proposition, as we know from the word *all* prefixed to the subject *animals,* which denotes that it must be taken in its full extent. Hence the power of beginning motion may be affirmed of all the different species of animals.

Particular propositions.

3. A *particular* proposition has in like manner some general term for its subject, but with a mark of limitation added, to denote that the predicate agrees only to some of the individuals comprehended under a species, or to one

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[1] See the preceding note, where it is demonstrated that the *terms* alone, and not the *ideas,* are in reality *general.* The term *man* is equally applicable to every individual of the human race; and therefore, what is affirmed or denied of *men* in general, is affirmed or denied of all the individuals, without regard to their discriminating qualities. *Some* is a definitive word (see GRAMMAR), which, prefixed to the word *man,* limits the signification of that *general term;* and therefore what is affirmed of *some men,* is affirmed only of *part* of the race, but that part itself is not ascertained.

mutable truths. If it be true that the whole is equal to all its parts, it must be so unchangeably; because the relation of equality, being attached to the ideas themselves, must ever intervene where the same ideas are compared. Of this nature are all the truths of natural religion, morality, and mathematics, and, in general, whatever may be gathered from the bare view and consideration of our ideas.

2. Experience.

4. The second ground of human judgment is Experience; from which we are led to infer the existence of those objects that surround us, and fall under the immediate notice of our senses. When we see the sun, or cast our eyes towards a building, we not only have perceptions of these objects within ourselves, but ascribe to them a real existence independent of the percipient mind. It is also by the information of the senses that we judge of the qualities of bodies; as when we say that "snow is white, fire hot, or steel hard." For as we are wholly unacquainted with the internal structure and constitution of the bodies which produce these sensations in us, and are unable to trace any connection between that structure and the sensations themselves, it is evident that we build our judgments altogether upon observation, ascribing to bodies such qualities as are answerable to the perceptions which they excite in us. Not that we ever suppose the qualities of bodies to be things of the same nature with our perceptions; for there is nothing in fire similar to the sensation of heat, or in a sword similar to that of pain; but when different bodies excite in our minds similar perceptions, we necessarily ascribe to these bodies, not only an existence independent of us, but likewise similar qualities, of which it is the nature to produce similar perceptions in the human mind. But this is not the only advantage derived from experience; for to that too we are indebted for all our knowledge regarding the co-existence of sensible qualities in objects, and the operations of bodies one upon another. Ivory, for instance, is hard and elastic; this we know by experience, and indeed by experience alone. For, being altogether strangers to the true nature both of elasticity and hardness, we cannot by the bare contemplation of our ideas determine how far the one necessarily implies the other, or whether there may not be a repugnance between them. But when we observe that both exist in the same object, we are then assured from experience that they are not incompatible; and when we also find that a stone is hard and not elastic, and that air though elastic is not hard, we likewise conclude upon the same foundation that the ideas are not necessarily conjoined, but may exist separately in different objects. In like manner, with regard to the operations of bodies upon one another, it is evident that our knowledge this way is all derived from observation. *Aqua regia* dissolves gold, as has been found by frequent trial, nor is there any other way of arriving at the discovery. Naturalists may tell us, if they please, that the parts of *aqua regia* are of a texture apt to insinuate between the corpuscles of gold, and thereby loosen and burst them asunder. If this be a true account of the matter, it will notwithstanding be allowed that our conjecture in regard to the conformation of these bodies is deduced from the experiment, and not the experiment from the conjecture. It was not from any previous knowledge of the intimate structure of *aqua regia* and *gold*, and the aptness of their parts to act or to be acted upon, that we came by the conclusion above mentioned. The internal constitution of bodies is in a manner wholly unknown to us; and could we even surmount this difficulty, yet, as the separation of the parts of gold implies something like an active force in the *menstruum*, and we are unable to conceive how the latter comes to be possessed of this activity, the effect must be owned to be altogether beyond our comprehension. But when repeated trials had once confirmed it, insomuch that it was admitted as an established truth in natural knowledge, it then became easy for men to spin out theories of their own invention, and contrive such a structure of parts, both for *gold* and *aqua regia*, as would best serve to explain the phenomenon upon the principles of that system of philosophy, whatever it might be, which they had adopted.

5. From what has been said, it is evident that as intuition is the foundation of what we call *scientific*, so experience is the foundation of what we call *natural* knowledge. For this last being wholly concerned with objects of sense, or those bodies that constitute the natural world, and their properties, as far as we can discover them, being to be traced only by a long and painful series of observations, it is apparent, that, in order to improve this branch of knowledge, we must betake ourselves to the method of trial and experiment.

6. But though experience is what we may term the immediate foundation of natural knowledge, yet with respect to particular persons its influence is very narrow and confined. The bodies that surround us are numerous, many of them lie at a great distance, and some are quite beyond our reach. Life is so short, and so crowded with cares, that but little time is left for any single man to employ himself in unfolding the mysteries of nature. Hence it is necessary to admit many things upon the testimony of others, which by this means becomes the foundation of a great part of our knowledge of body. No man doubts of the power of *aqua regia* to dissolve gold, though perhaps he never himself made the experiment. In these, therefore, and such like cases, we judge of the facts and operations of nature upon the mere ground of testimony. However, as we can always have recourse to experiment where any doubt or scruple arises, this is justly considered as the true foundation of natural philosophy, being indeed the ultimate support upon which our assent rests, and to which we appeal when the highest degree of evidence is required.

3. Test mony.

7. But there are many facts which do not admit of an appeal to the senses; and in this case testimony is the true and only foundation of our judgments. All human actions, of whatever kind, when considered as already past, are of the nature here described; because having now no longer any existence, both the facts themselves, and the circumstances attending them, can be known only from the relations of those who had sufficient opportunities of arriving at the truth. *Testimony*, therefore, is justly accounted a third ground of human judgment; and as from the other two we have deduced *scientific* and *natural* knowledge, so we may from this derive *historical*, by which we mean, not merely a knowledge of the civil transactions of states and kingdoms, but of all facts whatsoever, where testimony is the ultimate foundation of our belief.

2. *Of Affirmative and Negative Propositions.*

The su ject an predica of a pr sition.

1. Whilst the comparing of our ideas is considered merely as an act of the mind, assembling them together, and joining or disjoining them according to the result of its perceptions, we call it *judgment;* but when our judgments are put into words, they then bear the name of *propositions*. A proposition, therefore, is a sentence expressing some judgment of the mind, by which two or more ideas are affirmed to agree or disagree. Now, as our judgments include at least two ideas, one of which is affirmed or denied of the other, so must a proposition have terms answering to these ideas. The idea of which we affirm or deny, and of course the term expressing that idea, is called the *subject* of the proposition. The idea affirmed or denied, as also the term answering it, is called the *predicate*. Thus, in the proposition, "God is omnipotent," *God* is the subject, it being of him that we affirm omnipotence, and *om-*

nipotent is the predicate, because we affirm that the idea expressed by that word belongs to God.

2. But as in propositions ideas are either joined or disjoined, it is not enough to have terms expressing those ideas, unless we have also some words to denote their agreement or disagreement. That word in a proposition which connects two ideas together, is called the *copula;* and if a negative particle be annexed, we thereby understand that the ideas are disjoined. The *substantive verb* is commonly made use of for the copula, as in the above-mentioned proposition, "God is omnipotent," where *is* represents the copula, and signifies the agreement of the ideas of *God* and *omnipotence.* But if we mean to separate two ideas, then, besides the substantive verb, we must also use some particle of negation to express this repugnance. The proposition, "Man is not perfect," may serve as an example of this kind; for here the notion of *perfection* being removed from the idea of *man*, the negative particle *not* is inserted after the copula, to signify the disagreement between the subject and the predicate.

3. Every proposition necessarily consists of these three parts, but then it is not alike needful that they be all severally expressed in words; because the copula is often included in the term of the predicate, as when we say "He sits," which imports the same as "He is sitting." In the Latin language a single word has often the force of a whole sentence. Thus *ambulat* is the same as *ille est ambulans; amo*, as *ego sum amans;* and so in innumerable other instances, by which it appears that we are not so much to regard the number of words in a sentence, as the ideas which they represent, and the manner in which they are put together. For wherever two ideas are joined or disjoined in an expression, though of but a single word, it is evident that we have a subject, predicate, and copula, and of consequence a complete proposition.

4. When the mind joins two ideas, we call it an *affirmative* judgment; when it separates them, a *negative;* and as any two ideas compared together must necessarily either agree or not agree, it is evident that all our judgments fall under these two divisions. Hence, likewise, the propositions expressing these judgments are all either affirmative or negative. An affirmative proposition connects the predicate with the subject, as, "A stone is heavy;" a negative proposition separates them, as "God is not the author of evil." *Affirmation*, therefore, is the same as joining two ideas together; and this is effected by means of the copula. *Negation*, on the contrary, marks the repugnance between the ideas compared, in which case a negative particle must be called in to show that the connection included in the copula does not take place.

5. Hence we see the reason of the rule commonly laid down by logicians, That in all negative propositions the negation ought to affect the copula. For as the copula, when placed by itself between the subject and the predicate, manifestly binds them together, it is evident, that in order to render a proposition negative, the particles of negation must enter it in such a manner as to destroy this union. In a word, two ideas are only disjoined in a proposition when the negative particle may be so referred to the copula as to break the affirmation included in it, and undo that connection it would otherwise establish. When we say, for instance, "No man is perfect," take away the negation, and the copula of itself plainly unites the ideas in the proposition. But as this is the very reverse of what is intended, a negative mark is added, to show that this union does not take place here. The negation, therefore, by destroying the effect of the copula, changes the very nature of the proposition, insomuch that, instead of binding two ideas together, it denotes their separation. On the contrary, in this sentence, "The man who departs not from an upright behaviour is beloved of God," the predicate *beloved of God* is evidently affirmed of the subject an *upright man;* so that, notwithstanding the negative particle, the proposition is still affirmative. The reason is plain. The negation here affects not the copula, but, constituting properly a part of the subject, serves, with other terms in the sentence, to form one complex idea, of which the predicate *beloved of God* is directly affirmed.

Of Judgment.

3. *Of Universal and Particular Propositions.*

Division of propositions.

1. The next considerable division of propositions is that into *universal* and *particular.* Our ideas, according to what has been already observed, are all singular as they enter the mind, and represent individual objects. But as by abstraction we can render them universal, so as to comprehend a whole class of things, and sometimes several classes at once, hence the terms expressing these ideas must be in like manner universal. If, therefore, we suppose any general term to become the subject of a proposition, it is evident, that whatever is affirmed of the abstract idea belonging to that term, may be affirmed of all the individuals to which that idea extends. Thus, when we say, "Men are mortal," we consider mortality, not as confined to one or any number of particular men, but as what may be affirmed without restriction of the whole species. By this means the proposition becomes as general as the idea which forms the subject of it, and indeed derives its universality entirely from that idea, being more or less so according as this may be extended to more or fewer individuals. But it is further to be observed of these general terms, that they sometimes enter a proposition in their full latitude, as in the example above given, and sometimes appear with a mark of limitation. In this last case we are given to understand that the predicate agrees not to the whole universal idea, but only to a part of it; as in the proposition, "Some men are wise." Here wisdom is not affirmed of every particular man, but is restricted to a few of the human species.[1]

Propositions are universal where the subject is so.

2. Now, from this different appearance of the general idea which constitutes the subject of any judgment, arises the division of propositions into *universal* and *particular.* An universal proposition is that in which the subject is some general term taken in its full latitude, insomuch that the predicate agrees to all the individuals comprehended under it if it denotes a proper species, and to all the several species and their individuals if it marks an idea of a higher order. The words *all, every, no, none*, &c. are the proper signs of this universality; and as they seldom fail to accompany general truths, so they form the most obvious criterion by which to distinguish them. "All animals have a power of beginning motion." This is an universal proposition, as we know from the word *all* prefixed to the subject *animals*, which denotes that it must be taken in its full extent. Hence the power of beginning motion may be affirmed of all the different species of animals.

Particular propositions.

3. A *particular* proposition has in like manner some general term for its subject, but with a mark of limitation added, to denote that the predicate agrees only to some of the individuals comprehended under a species, or to one

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[1] See the preceding note, where it is demonstrated that the *terms* alone, and not the *ideas*, are in reality *general.* The term *man* is equally applicable to every individual of the human race; and therefore, what is affirmed or denied of *men* in general, is affirmed or denied of all the individuals, without regard to their discriminating qualities. *Some* is a definitive word (see GRAMMAR), which, prefixed to the word *man*, limits the signification of that *general term;* and therefore what is affirmed of *some men*, is affirmed only of *part* of the race, but that part itself is not ascertained.

or more of the species belonging to a genus, and not to the entire universal idea. Thus, "Some stones are heavier than iron;" "Some men have an uncommon share of prudence." In the latter of these propositions, the subject *some men* implies only a certain number of individuals, comprehended under a single species. In the former, where the subject is a genus which extends to a great variety of distinct classes, *some stones* may not only imply any number of particular stones, but also several whole species of stones, inasmuch as there may be not a few with the property there described. Hence we see that a proposition does not cease to be particular by the predicate's agreeing to a whole species, unless that species, singly and distinctly considered, forms also the subject of which we affirm or deny.

Singular propositions.

4. There is still one species of propositions which remains to be described, and which the more deserves our notice, as it is not yet agreed amongst logicians to which of the two classes mentioned above they ought to be referred; namely, *singular* propositions, or those where the subject is an individual. Of this nature are the following: "Sir Isaac Newton was the inventor of fluxions;" "This book contains many useful truths." What occasions some difficulty as to the proper rank of these propositions is, that the subject being taken according to the whole of its extension, they sometimes have the same effect in reasoning as universals. But if it be considered that they are in truth the most limited kind of particular propositions, and that no proposition can with any propriety be called universal but where the subject is some universal idea, we shall not find any difficulty in determining to which class they ought to be referred. When we say, "Some books contain useful truths," the proposition is particular, because the general term appears with a mark of restriction. If, therefore, we say, "This book contains useful truths," it is evident that the proposition must be still more particular, as the limitation implied in the word *this* is of a more confined nature than in the former case.

Fourfold division of propositions.

5. We perceive, therefore, that all propositions are either *affirmative* or *negative;* nor is it less evident that in both cases they may be *universal* or *particular*. Hence arises that celebrated fourfold division of them into *universal affirmative* and *universal negative*, *particular affirmative* and *particular negative*, which indeed comprehends all their varieties. The use of this method of distinguishing them will appear more fully afterwards, when we come to treat of reasoning and syllogism.

4. *Of Absolute and Conditional Propositions.*

Distinction of qualities.

1. The objects about which we are chiefly conversant in this world, are all of a nature very liable to change. What may be affirmed of them at one time, cannot often be affirmed at another; and one of the objects of our knowledge is to enable us to distinguish rightly these variations, and trace the reasons upon which they depend. For it is observable, that amidst all the vicissitudes of nature, some things remain constant and invariable; nor are even the changes to which we see others liable, effected, except in consequence of uniform and steady laws, which, when known, are sufficient to direct us in our judgments concerning them. Hence philosophers, in distinguishing the objects of our perception into various classes, have been very careful to state, that some properties belong so essentially to the general idea, as not to be separable from it except by destroying its very nature; whilst others are only accidental, and may be affirmed or denied of it in different circumstances. Thus solidity, a yellow colour, and a great weight, are considered as essential qualities of gold; but whether it shall exist as an uniform conjoined mass, is not alike necessary. We find that by a proper menstruum it may be reduced to a very fine powder, and that an intense heat will bring it into a state of fusion.

Of Judgm

Diversi in our n ner of j ing.

2. From this diversity in the several qualities of things arises a considerable difference as to the manner of our judging concerning them. For all such properties as are inseparable from objects when considered as belonging to any genus or species, are affirmed absolutely and without reserve of that general idea. Thus we say, "Gold is very weighty;" "A stone is hard;" "Animals have a power of self-motion." But in the case of mutual or accidental qualities, as they depend upon some other consideration distinct from the general idea, that must also be taken into the account, in order to form an accurate judgment. Should we affirm, for instance, of some stones, that they are very susceptible of a rolling motion, the proposition, whilst it remains in this general form, cannot with any advantage be introduced into our reasonings. An aptness to receive that mode of motion flows from the figure of the stone, which, as it may vary infinitely, so our judgment only becomes applicable and determinate, when the particular figure, of which volubility is a consequence, is also taken into the account. Let us then introduce this other consideration, and the proposition will run as follows: "Stones of a spherical form are easily put into a rolling motion." Here we see the condition upon which the predicate is affirmed, and therefore know in what particular cases the proposition may be applied.

Absolut and con ditional proposi tions.

3. This consideration of propositions respecting the manner in which the predicate is affirmed of the subject, gives rise to the division of them into *absolute* and *conditional*. *Absolute* propositions are those in which we affirm some property inseparable from the idea of the subject, and which therefore belongs to it in all possible cases; as, "God is infinitely wise;" "Virtue tends to the ultimate happiness of man." But where the predicate is not necessarily connected with the idea of the subject, unless upon some consideration distinct from that idea, there the proposition is called *conditional*. The reason of the name is taken from the supposition annexed, which is of the nature of a condition, and may be expressed as such, thus: "If a stone be exposed to the rays of the sun, it will contract some degree of heat;" "If a river run in a very declining channel, its rapidity will constantly increase."

Impor tance of this divi sion.

4. There is not any thing of greater importance in philosophy than a due attention to this division of propositions. If we be careful never to affirm things absolutely excepting where the ideas are inseparably conjoined, and if in our other judgments we distinctly mark the conditions which determine the predicate to belong to the subject, we shall be the less liable to mistake in applying general truths to the particular concerns of human life. It is owing to the exact observance of this rule that mathematicians have been so fortunate in their discoveries, and that what they demonstrate of magnitude in general may be applied with ease in all obvious occurrences.

5. The truth of it is, that particular propositions are only known to be true, when we can trace their connection with universals; and it is accordingly the great business of science to find out general truths which may be applied with safety in all obvious instances. Now the great advantage arising from determining with care the conditions upon which one idea may be affirmed or denied of another, is this; that thereby particular propositions really become universal, may be introduced with certainty into our reasonings, and serve as standards to conduct and regulate our judgments. To illustrate this by a familiar instance; if we say, "Some water acts very forcibly," the proposition is particular; and as the conditions on which this forcible action depends are not mentioned, it is as yet uncertain in what cases it may be applied. Let us then supply these conditions, and the proposition will run thus: "Water conveyed in sufficient quantity along a steep descent acts very

forcibly." Here we have an universal judgment, inasmuch as the predicate *forcible action* may be ascribed to all water under the circumstances mentioned. Nor is it less evident that the proposition in this new form is of easy application; and in fact we find that men do apply it in instances where the forcible action of water is required, as in corn-mills and many other works of art.

5. *Of Simple and Compound Propositions.*

1. Hitherto we have treated of propositions where only two ideas are compared together. These are in the general called *simple*, because, having but one subject and one predicate, they are the effect of a simple judgment, that admits of no subdivision. But if it so happens that several ideas offer themselves to our thoughts at once, by which we are led to affirm the same thing of different objects, or different things of the same object, then the propositions expressing these judgments are called *compound;* because they may be resolved into as many others as there are subjects or predicates in the whole complex determination on the mind. Thus, "God is infinitely wise and infinitely powerful." Here there are two predicates, *infinite wisdom*, and *infinite power*, both affirmed of the same subject; and accordingly the proposition may be resolved into two others, affirming these predicates severally. In like manner, in the proposition, "Neither kings nor people are exempt from death," the predicate is denied of both subjects, and may therefore be separated from them in distinct propositions. Nor is it less evident, that if a complex judgment consists of several subjects and predicates, it may be resolved into as many simple propositions as are the number of different ideas compared together. "Riches and honours are apt to elate the mind, and increase the number of our desires." In this judgment there are two subjects and two predicates, and it is at the same time apparent that it may be resolved into four distinct propositions. "Riches are apt to elate the mind;" "Riches are apt to increase the number of our desires." And so of "honours."

2. Logicians have divided these compound propositions into a great many different classes; but, in our opinion, not with a due regard to their proper definition. Thus, *conditionals, causals, relatives*, and others, are mentioned as so many distinct species of this kind, though in fact they are no more than simple propositions. To give an instance of a conditional; "If a stone be exposed to the rays of the sun, it will contract some degree of heat." Here we have but one subject and one predicate; for the complex expression, *a stone exposed to the rays of the sun*, constitutes the proper subject of this proposition, and is no more than one determinate idea. The same thing happens in causals. Thus, "Rehoboam was unhappy because he followed evil counsel." Here there is an appearance of two propositions arising from the complexity of the expression; but when we come to consider the matter more nearly, it is evident that we have but a single subject and predicate. "The pursuit of evil counsel brought misery upon Rehoboam." It is not enough, therefore, to render a proposition compound, that the subject and predicate are complex notions, requiring sometimes a whole sentence to express them; for in this case the comparison is still confined to two ideas, and constitutes what we call a simple judgment. But where there are several subjects or predicates, or both, as the affirmation or negation may be alike extended to them all, the proposition expressing such a judgment is truly a collection of as many simple ones as there are different ideas compared. Confining ourselves, therefore, to this more strict and just notion of compound propositions, they are all reducible to two kinds, viz. *copulatives* and *disjunctives*.

3. A *copulative* proposition is, where the subjects and predicates are so linked together that they may be all severally affirmed or denied one of another. Of this nature are the examples of compound propositions given above. "Riches and honours are apt to elate the mind, and increase the number of our desires;" "Neither kings nor people are exempt from death." In the first of these, the two predicates may be affirmed severally of each subject, whence we have four distinct propositions. The other furnishes an example of the negative kind, where the same predicate, being disjoined from both subjects, may be also denied of them in separate propositions.

Disjunctive propositions.

4. The other species of compound propositions are those called disjunctive; in which, comparing several predicates with the same subject, we affirm that one of them necessarily belongs to it, but leave the particular predicate undetermined. If any one, for example, says, "This world either exists of itself, or is the work of some all-wise and powerful cause," it is evident that one of the two predicates must belong to the world; but as the proposition determines not which, it is therefore of the kind we call *disjunctive.* Such too are the following: "The sun either moves round the earth, or is the centre about which the earth revolves;" "Friendship finds men equal, or makes them so." It is the nature of all propositions of this class, supposing them to be exact in point of form, that upon determining the particular predicate, the rest are of course to be removed; or if all the predicates but one are removed, that one necessarily takes effect, to the exclusion of the others. Thus, in the example given above, if we allow the world to be the work of some wise and powerful cause, we of course deny it to be self-existent; or if we deny it to be self-existent, we must necessarily admit that it was produced by some wise and powerful cause. Now this particular manner of linking the predicates together, so that the establishing of one displaces all the rest, or the excluding all but one necessarily establishes that one, cannot otherwise be effected than by means of *disjunctive* particles. And hence it is that propositions of this class take their names from these particles, which form so necessary a part of them, and indeed constitute their very nature considered as a distinct species.

6. *Of the Division of Propositions into Self-evident and Demonstrable.*

Propositions divided into self-evident and demonstrable.

1. When any proposition is offered to the view of the mind, if the terms in which it is expressed be understood, upon comparing the ideas together, the agreement or disagreement asserted will either be immediately perceived, or will be found to lie beyond the actual reach of the understanding. In the first case, the proposition is said to be *self-evident*, and admits not of any proof, because a bare attention to the ideas themselves produces full conviction and certainty; nor is it possible to call in any thing more evident by way of confirmation. But where the connection or repugnance comes not so readily under the inspection of the mind, we must have recourse to reasoning; and if by a clear series of proofs we can make out the truth proposed, insomuch that self-evidence shall accompany every step of the procedure, we are then able to demonstrate what we assert, and the proposition itself is said to be *demonstrable.* When we affirm, for instance, "That it is impossible for the same thing to be and not to be," whoever understands the terms made use of, perceives at the first glance the truth of what is asserted, nor can he by any efforts bring himself to believe the contrary. The proposition, therefore, is *self-evident*, and such that it is impossible by reasoning to make it plainer; because there is no truth more obvious or better known, from which it may be deduced as a consequence. But if we say, "This world had a beginning," the assertion is indeed equally true, but shines not forth with the same degree of evidence. We find great difficulty in con-

ceiving how the world could be made out of nothing, and are not brought to a free and full consent, until by reasoning we arrive at a clear view of the absurdity involved in the contrary supposition. Hence this proposition is of the kind we call *demonstrable*, inasmuch as its truth is not immediately perceived by the mind, but yet may be made clear by means of others more known and obvious, whence it follows as an unavoidable consequence.

Self-evident truths.

2. From what has been said, it appears that reasoning is employed only about demonstrable propositions, and that our intuitive and self-evident perceptions are the ultimate foundation upon which it rests.

3. Self-evident propositions furnish the first principles of reasoning; and it is certain, that if in our researches we employ only such principles as possess this character of self-evidence, and apply them according to the rules to be afterwards explained, we shall be in no danger of error in advancing from one discovery to another. For this we may appeal to the writings of the mathematicians, which being conducted by the express model here mentioned, furnish incontestable proof of the firmness and stability of human knowledge, when built upon so sure a foundation. For not only have the propositions of this science stood the test of ages, but they are found attended with that invincible evidence, which forces the assent of all who duly consider the proofs upon which they are established. Since the mathematicians are universally allowed to have hit upon the right method of arriving at unknown truths, since they have been the happiest in the choice as well as the application of their principles, it may not be amiss to explain here their method of stating self-evident propositions, and applying them to the purposes of demonstration.

Definition a help to clearness and evidence in knowledge.

4. First, then, it is to be observed, that they have been very careful in ascertaining their ideas, and fixing the signification of their terms. For this purpose they begin with *definitions*, in which the meaning of their words is so distinctly explained, that they cannot fail to excite in the mind of an attentive reader the very same ideas which are annexed to them by the writer. And indeed the clearness and irresistible evidence of mathematical knowledge is owing to nothing so much as this care in laying the foundation. Where the relation between any two ideas is accurately and justly traced, it will not be difficult for another to comprehend that relation, if in setting himself to discover it he brings the very same ideas into comparison. But if, on the contrary, he affixes to his words ideas different from those that were in the mind of him who first advanced the demonstration, it is evident, that as the same ideas are not compared, the same relation cannot subsist, insomuch that a proposition will be rejected as false, which, had the terms been rightly understood, must have appeared incontestably true. A square, for instance, is a figure bounded by four equal right lines, joined together at right angles. Here the nature of the angles constitutes a part of the idea no less than the equality of the sides; and many properties demonstrated of the square are deduced entirely from its being a rectangular figure. If therefore we suppose a man, who has formed a partial notion of a square, comprehending only the equality of its sides, without regard to the angles, reading some demonstration which implies also this latter consideration, it is plain that he would reject it as not universally true, inasmuch as it could not be applied where the sides were joined together at equal angles. For this last figure, answering still to his idea of a square, would be yet found without the property assigned to it in the proposition. But if he comes afterwards to correct his notion, and to render his idea complete, he will then readily admit the truth and justness of the demonstration.

Their use in mathematics.

5. We see, therefore, that nothing contributes so much to the improvement and certainty of human knowledge, as the having determinate ideas, and keeping them steady and invariable in all our discourses and reasonings concerning them. On this account it is that mathematicians, as has already been observed, always begin by defining their terms, and distinctly unfolding the notions which they are intended to express. Hence such as apply themselves to these studies have exactly the same views of things; and, bringing always the very same ideas into comparison, they readily discern the relations between them. It is likewise of importance, in every demonstration, to express the same *idea* invariably by the same word. From this practice mathematicians never deviate; and if it be necessary in *their* demonstrations, where the reader's comprehension is *aided* by a diagram, it is much more so in all reasonings concerning moral or intellectual truths, where the ideas cannot be represented by a diagram. The observation of this rule may sometimes be productive of ill-sounding periods; but when *truth* is the object, euphony ought to be disregarded.

Establis- ment of principle the seco step in m thematic knowled

6. When the mathematicians have taken this first step, and made known the ideas the relations of which they intend to investigate, their next care is, to lay down some self-evident truths, which may serve as a foundation for their future reasonings. And here indeed they proceed with remarkable circumspection, admitting no principles but such as flow immediately from their definitions, and necessarily force themselves upon every mind in any degree attentive to its ideas. Thus a *circle* is a figure formed by a right line moving round some fixed point in the same plane. The fixed point round which the line is supposed to move, and where one of its extremities terminates, is called the *centre* of the circle. The other extremity, which is conceived to be carried round until it returns to the point whence it first set out, describes a curve running into itself, which is termed the *circumference*. All right lines drawn from the centre to the circumference are called *radii*. From this definition geometricians derive the self-evident truth, "That the radii of the same circle are all equal to one another;" or rather, perhaps, it is part of, and involved in, the very definition.

Proposi- tions divi ed into sp culative and pract cal.

7. We may now observe, that in all propositions we either affirm or deny some property of the idea which constitutes the subject of our judgment, or we maintain that something may be done or effected. The first sort are called *speculative* propositions, as in the example mentioned above, "The radii of the same circle are all equal one to another." The others are called *practical*, for a reason too obvious to be mentioned; thus, "That a right line may be drawn from one point to another," is a practical proposition, inasmuch as it expresses that something may be done.

Mathem tical prin ciples, ho distin- guished.

8. From this twofold consideration of propositions arises the twofold division of mathematical principles into axioms and postulates. By an *axiom* is understood any self-evident speculative truth; such as, "That the whole is greater than its parts;" "That things equal to one and the same thing are equal to one another." But a self-evident practical proposition is what is denominated a *postulate*. Such are those of Euclid: "That a finite right line may be continued directly forwards;" "That a circle may be described about any centre with any distance." And here we have to observe, that as in an axiom the agreement or disagreement between the subject and predicate must come under the immediate inspection of the mind; so in a postulate, not only the possibility of the thing asserted must be evident at first view, but also the manner in which it may be effected. For where this manner is not of itself apparent, the proposition comes under the notion of the demonstrable kind, and is treated as such by geometrical writers. Thus, "To draw a right line from one point to another," is assumed by Euclid as a postulate, because the manner of doing it is so obvious, as to require no previous teaching. But then it is not equally evident how we are to construct an equilateral triangle. For this reason he advances it

as a demonstrable proposition, lays down rules for the exact performance, and at the same time proves, that if these rules are followed, the figure described will be an equilateral triangle.

9. This leads us to take notice, that as self-evident truths are distinguishable into different kinds, according as they are speculative or practical, so is it also with demonstrable propositions. A demonstrable speculative proposition is by mathematicians called a *theorem.* Such is the famous forty-seventh proposition of the first book of the Elements, known by the name of the *Pythagorean theorem*, from its supposed inventor Pythagoras, viz. "That in every right-angled triangle, the square described upon the side subtending the right angle is equal to the sum of the squares described upon the sides containing the right angle." On the other hand, a demonstrable practical proposition is called a *problem;* as where Euclid teaches us to describe a square upon a given right line.

10. It may not be amiss to add, that, besides the four kinds of propositions already mentioned, mathematicians have also a fifth, known by the name of *corollaries.* These are usually subjoined in theorems or problems, and differ from them only in this, that they flow from what is there demonstrated, in so obvious a manner as to discover their dependence upon the proposition whence they are deduced, almost as soon as proposed. Thus, Euclid, having demonstrated, "That in every right-lined triangle all the three angles taken together are equal to two right angles," adds by way of corollary, "That all the three angles of any one triangle taken together are equal to all the three angles of any other triangle taken together;" which is evident at first sight, because in all cases they are equal to two right angles, and things which are equal to one and the same thing are equal to one another.[1]

11. The scholia of mathematicians are indifferently annexed to definitions, propositions, or corollaries, and answer the same purposes as annotations upon a classic author. For in them occasion is taken to explain whatever may appear intricate and obscure in a train of reasoning; to answer objections; to teach the application and uses of propositions; to lay open the origin and history of the several discoveries which have been made in the science; and, in a word, to acquaint us with all such particulars as deserve to be known, whether considered as points of curiosity or of profit.

III.—OF REASONING.

1. *Of Reasoning in general, and the Parts of which it consists.*

Remote relations discovered by means of intermediate ideas.

It often happens, in comparing together ideas, that their agreement or disagreement cannot be discerned at first view, especially if they are of such a nature as not to admit of an exact application one to another.

When, for instance, we compare two figures of a different form, in order to judge of their equality or inequality, it is plain, that by barely considering the figures themselves, we cannot arrive at an exact determination, because, by reason of their disagreeing forms, it is impossible so to put them together that their several parts shall mutually coincide. Here, then, it becomes necessary to look out for some third idea which will admit of such an application as the case requires, wherein, if we succeed, all difficulties vanish, and the relation we are in quest of may be traced with ease. Thus, right-lined figures are all reduced to squares, by means of which we can measure their areas, and determine exactly their agreement or disagreement in point of magnitude.

This manner of arriving at truth termed reasoning.

2. But how can any third idea serve to discover a relation between two others? The answer is, by being compared severally with these others; for such a comparison enables us to discern how far the ideas with which this third is compared are connected or disjoined between themselves. In the example mentioned above, of two right-lined figures, if we compare each of them with some square whose area is known, and find the one exactly equal to it, and the other less by a square inch, we immediately conclude that the area of the first figure is a square inch greater than that of the second. This manner of determining the relation between any two ideas, by the intervention of some third one with which they may be compared, is that which we call *reasoning*, and is indeed the chief instrument by which we extend our discoveries and enlarge our knowledge. The great art consists in finding out such intermediate ideas as, when compared with others in the question, will furnish evident and known truths; because, as will afterwards appear, it is only by means of these that we arrive at the knowledge of what is hidden and remote.

The parts that constitute an act of reasoning and a syllogism.

3. Hence it appears that every act of reasoning necessarily includes three distinct judgments; two in which the ideas whose relation we want to discover are severally compared with the middle idea, and a third in which they are themselves connected or disjoined, according to the result of that comparison. Now, as in the second part of logic, our judgments, when put into words, were called propositions, so here in the third part the expressions of our reasonings are termed *syllogisms.* And hence it follows, that as every act of reasoning implies three several judgments, so every syllogism must include three distinct propositions. When reasoning is thus put into words, and appears in the form of a syllogism, the intermediate idea made use of to discover the agreement or disagreement we search for is called the *middle term*, and the two ideas themselves with which this third is compared are denominated the *extremes.*

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[1] It is proper here to caution the reader against being led into any misconception as to the real nature of *axioms*, which, as above stated, have commonly been understood to mean "self-evident speculative truths." That they are "self-evident" is undeniable; but it is not so easy to see how they can be called "speculative truths," since in all cases where they predicate *equality* they are *identical propositions*, and, where they do not, they are mere *truisms*, if we may use such a term, or propositions of such a kind that to suppose the contrary would involve an obvious absurdity. When we say, That the whole is equal to all its parts put together, or, That things which are equal to the same thing are equal to one another, we merely express two identical propositions, or in effect just affirm that $a = a$, and $y = y$; affirmations which can add nothing either to the evidence or the truth of any demonstration. Such propositions amount only to a sort of *jeu de mots.* Besides, they are illogical, inasmuch as the "self-evident" truth which is predicated in the second is invariably assumed in the first branch of the proposition. The "whole" necessarily includes all its parts, and "things equal to one and the same thing" involve mutual equality. If we were to repeat the axiom, "That whatever is, is for an age, or for ages, we would not be in any respect wiser, or nearer to the discovery of any truth not self-evident, than we were before. Again, when we say, That the whole is greater than any of its parts, we merely affirm a truism, since the bare idea of a "whole" necessarily excludes that of the equality of any of its parts. It is, therefore, a mistake to suppose that axioms add any thing to the clearness or force of mathematical evidence. No conclusion whatever can be deduced from an identical proposition, in which the thing assumed is also the thing predicated. The whole fabric of geometry is built, not upon axioms, but upon *definitions*, expressing simple facts, as, for instance, the definition of a circle; and the real character of geometrical evidence consists in this, that it is founded, not upon identical propositions or truisms, but upon an appeal to observation, though of the simplest and most elementary kind. (A.)

Of Reasoning.

4. But as these things are best illustrated by examples, let us, for instance, set ourselves to inquire "Whether men be accountable for their actions." As the relation between the ideas of *man* and *accountableness* comes not within the immediate view of the mind, our first care must be to find out some third idea that will enable us the more easily to discover and trace it. A very small measure of reflection is sufficient to inform us, that no creature can be accountable for his actions unless we suppose him capable of distinguishing good from evil; that is, unless we suppose him possessed of reason. Nor is this alone sufficient. For what would it avail him to know good from evil actions if he had no freedom of choice, and could not avoid the one or pursue the other? Hence it becomes necessary to take in both considerations in the present case. It is at the same time equally apparent, that wherever there is the ability of distinguishing good from bad actions, and of pursuing the one and avoiding the other, there also a creature is accountable. We have then got a third idea, with which *accountableness* is inseparably connected, viz. *reason and liberty*, which are here to be considered as forming one complex conception. Let us now take this middle idea, and compare it with the other term in the question, viz. *man*, and we all know by experience that it may be affirmed of him. Having thus, by means of the intermediate idea, formed two several judgments, viz. *that man is possessed of reason and liberty*, and *that reason and liberty imply accountableness*, a third obviously and necessarily follows, viz. *that man is accountable for his actions.* Here then we have a complete act of reasoning, in which, according to what has been already observed, there are three distinct judgments; two which may be styled previous, inasmuch as they lead to the other, and arise from comparing the middle idea with the two ideas contained in the question; the third is a consequence of these previous acts, and flows from combining the extreme ideas between themselves. If now we put this reasoning into words, it exhibits what logicians term a syllogism, and, when proposed in due form, runs thus: "Every creature possessed of reason and liberty is accountable for his actions. Man is a creature possessed of reason and liberty: Therefore man is accountable for his actions."

Premises, conclusion, extremes middle term.

5. In this syllogism we may observe, that there are three several propositions expressing the three judgments implied in the act of reasoning, and so disposed as to represent distinctly what passes within the mind in tracing the more distant relations of its ideas. The first two propositions answer the two previous judgments in reasoning, and are called the *premises*, because they are placed before the other. The third is termed the *conclusion*, as being gained in consequence of what was asserted in the premises. We are also to remember that the terms expressing the two ideas the relations of which we inquire into, as *man* and *accountableness*, are in general called the *extremes;* and that the intermediate idea, by means of which the relation is traced, viz. *a creature possessed of reason and liberty*, takes the name of the *middle term.* Hence it follows, that by the *premises* of a syllogism we are always to understand the two propositions where the middle term is severally compared with the *extremes;* for these constitute the previous judgments, whence the truth we are in quest of is by reasoning deduced. The *conclusion* is that other proposition, in which the *extremes* themselves are joined or separated, agreeably to what appears upon the above comparison.

Of Reasoni

Major a minor term, m jor and nor prop sition.

6. The conclusion is made up of the extreme terms of the syllogism; and the extreme which serves as the predicate of the conclusion goes by the name of the *major term;* the other extreme, which makes the subject in the same proposition, is called the *minor term.* From this distinction of the extremes arises also a distinction between the premises, where these extremes are severally compared with the middle term. That proposition which compares the greater extreme, or the predicate of the conclusion, with the middle term, is called the *major proposition;* the other, in which the same middle term is compared with the subject of the conclusion or lesser extreme, is called the *minor proposition.* All this is obvious from the syllogism already stated, where the conclusion is, "Man is accountable for his actions." For here the predicate *accountable for his actions* being connected with the middle term in the first of the two premises, "Every creature possessed of reason and liberty is accountable for his actions," gives what we call the *major proposition.* In the second of the premises, "Man is a creature possessed of reason and liberty," we find the lesser extreme, or subject of the conclusion, viz. *man*, connected with the same middle term, whence it is known to be the *minor proposition.* When a syllogism is proposed in due form, the major proposition is always placed first, the minor next, and the conclusion last.

In a sing act of re soning, t premises must be i tuitive truths.

7. These things being premised, we may in general define reasoning to be an act or operation of the mind deducing some unknown proposition from other previous ones which are evident and known. These previous propositions, in a simple act of reasoning, are only two in number; and it is always required that they be of themselves apparent to the understanding, insomuch that we assent to and perceive the truth of them as soon as proposed. In the syllogism above given, the premises are supposed to be self-evident truths, otherwise the conclusion could not be inferred by a single act of reasoning. If, for instance, in the major, "Every creature possessed of reason and liberty is accountable for his actions," the connection between the subject and predicate could not be perceived by a bare attention to the ideas themselves, it is evident that this proposition would no less require a proof than the conclusion deduced from it. In this case a new middle term must be sought for to trace the connection here supposed; and this of course furnishes another syllogism, by which having established the proposition in question, we are then, and not before, at liberty to use it in any succeeding train of reasoning. And should it so happen, that in this second essay there still existed some previous proposition whose truth did not appear at first sight, we must then have recourse to a third syllogism in order to lay open that truth to the mind; because, as long as the premises remain uncertain, the conclusion built upon them must be so likewise. When, by conducting our thoughts in this manner, we at last arrive at some syllogism where the previous propositions are intuitive truths, the mind then rests in full security, as perceiving that the several conclusions it has passed through stand upon the immoveable foundation of self-evidence, and, when traced to their source, terminate in it.

Reasoning only a con catenation of syllo gisms.

8. We see, therefore, that in order to infer a conclusion by a single act of reasoning, the premises must be intuitive propositions. Where they are not, previous syllogisms are required; in which case reasoning becomes a complicated act, taking in a variety of successive steps. This frequently happens in tracing the more remote relation of our ideas, where, many middle terms being called in, the conclusion cannot be made out but in consequence of a series of syllogisms following one another in train. But although in this concatenation of propositions, those which form the premises of the last syllogism are often considerably removed from self-evidence, yet if we trace the reasoning backwards, we shall find them the conclusions of previous syllogisms, whose premises approach nearer and nearer to intuition in proportion as we advance, and are found at last to terminate in it. And if, after having thus unravelled a demonstration, we take it the contrary way,

and observe how the mind, setting out with intuitive perceptions, couples them together to form a conclusion; how, by introducing this conclusion into another syllogism, it still advances one step farther, and so proceeds, making every new discovery subservient to its future progress; we shall then perceive clearly that reasoning, in the highest sense of that faculty, is no more than an orderly combination of those simple acts which we have already so fully explained.

9. Thus we see, that reasoning, beginning with first principles, rises gradually from one judgment to another, and connects them in such manner that every stage of the progression brings intuitive certainty along with it. And now at length we may clearly understand the definition given above of this distinguishing faculty of the human mind. Reason, we have said, is the ability of deducing unknown truths from principles or propositions which are already known. This appears evident by the foregoing account, where we see that no proposition is admitted into a syllogism to serve as one of the previous judgments on which the conclusion rests, unless it be itself a known and established truth, the connection of which with self-evident principles has already been traced.

2. *Of the several kinds of Reasoning; and, first, of that by which we determine the Genera and Species of Things.*

All the aims of human reason may in the general be reduced to these two: First, to rank things under those universal ideas to which they truly belong; and, secondly, to ascribe to them their several attributes and properties in consequence of that distribution.

2. One great aim of human reason is to determine the genera and species of things. We have seen, in the first part of this treatise, how the mind proceeds in framing general ideas. We have also seen, in the second part, how, by means of these general ideas, we come by universal propositions. Now, as in these universal propositions we affirm some property of a genus or species, it is plain that we cannot apply this property to particular objects till we have first determined whether they are comprehended under that general idea of which the property is affirmed. Thus there are certain properties belonging to all *even* numbers, which nevertheless cannot be applied to any particular number, until we have first discovered it to be of the species expressed by that natural name. Hence reasoning begins with referring things to their several divisions and classes in the scale of our ideas; and as these divisions are all distinguished by particular names, we thereby learn to apply the terms expressing general conceptions to such particular objects as come under our immediate observation.

3. Now, in order to arrive at these conclusions, by which the several objects of perception are brought under general names, two things are manifestly necessary. First, that we should take a view of the idea itself, which is denoted by that general name, and carefully attend to the distinguishing marks which serve to characterize it. Secondly, that we should compare this idea with the object under consideration, observing diligently wherein they agree or differ. If the idea be found to correspond with the particular object, we then without hesitation apply the general name; but if no such correspondence intervene, the conclusion must necessarily take a contrary turn. Let us, for instance, take the number *eight*, and consider by what steps we are led to pronounce it an *even* number. First, then, we call to mind the idea signified by the expression *an even number*, viz. that it is a number divisible into two equal parts. We then compare this idea with the number *eight*, and finding them manifestly to agree, see at once the necessity of admitting the conclusion. These several judgments, therefore, transferred into language, and reduced to the form of a syllogism, appear thus: "Every number that may be divided into two equal parts is an *even* number: The number eight may be divided into two equal parts: Therefore the number *eight* is an *even* number."

Those steps always followed.

4. Here it may be observed, that where the general idea, to which particular objects are referred, is perfectly familiar to the mind, and frequently in view, this reference, and the application of the general name, seem to be made without any apparatus of reasoning. When we see a horse in the fields, or a dog in the street, we readily apply the name of the species; habit, and a familiar acquaintance with the general idea, suggesting it instantaneously to the mind. We are not however to imagine on this account that the understanding departs from the usual rules of just thinking. A frequent repetition of acts begets a habit; and habits are attended with a certain promptness of execution, which prevents our observing the several steps and gradations by which any course of action is accomplished. But in other instances, where we judge not by precontracted habits, as when the general idea is very complex, or less familiar to the mind, we always proceed according to the form of reasoning established above. A goldsmith, for instance, who is in doubt as to any piece of metal, whether it be of the species called *gold*, first examines its properties, and then, comparing them with the general idea signified by that name, if he find a perfect correspondence, no longer hesitates under what class of metals to rank it.

Importance of this branch of reasoning.

5. Nor let it be imagined that our researches here, because in appearance bounded to the imposing of general names upon particular objects, are therefore trivial and of little consequence. Some of the most considerable debates amongst mankind, and such too as nearly regard their lives, interest, and happiness, turn wholly upon this article. Is it not the chief employment of our several courts of judicature to determine, in particular instances, what is law, justice, and equity? Of what importance is it in many cases to decide aright whether an action shall be termed *murder* or *manslaughter?* We perceive then that no less than the lives and fortunes of men depend often upon these decisions. The reason is plain. Actions, when once referred to a general idea, draw after them all that may be affirmed of that idea; insomuch that the determining the species of actions is all one with determining what proportion of praise or dispraise, commendation or blame, ought to follow them. For as it is allowed that murder deserves death, by bringing any particular action under the head of murder, we of course decide the punishment due to it.

Exact observance of it practised by mathematicians.

6. But the great importance of this branch of reasoning, and the necessity of care and circumspection in referring particular objects to general ideas, is still further evident from the practice of the mathematicians. Every one who has read Euclid, knows that he frequently requires us to draw lines through certain points, and according to such and such directions; and that the figures thence resulting are often squares, parallelograms, or rectangles. Yet Euclid never supposes this from their bare appearance, but always demonstrates it upon the strictest principles of geometry. Nor is the method he takes in any thing different from that described above. Thus, for instance, having defined a square to be a figure bounded by four equal sides joined together at right angles, when such a figure arises in any construction previous to the demonstration of a proposition, he never calls it by that name until he has shown that its sides are equal, and all its angles right angles. Now this is apparently the same form of reasoning we have before exhibited in proving *eight* to be an even number.

Fixed invariable ideas.

7. Having thus explained the rules by which we are to conduct ourselves in ranking particular objects under general ideas, and shown their conformity to the practice and manner of the mathematicians, it remains only to observe, that the true way of rendering this part of knowledge both

easy and certain is, by habituating ourselves to clear and determinate ideas, and by keeping these steadily annexed to their respective names. For as all our aim is to apply general words aright, if these words stand for invariable ideas which are perfectly known to the mind, and can be readily distinguished upon occasion, there will be little danger of mistake or error in our reasonings. Let us suppose that, by examining any object, and carrying our attention successively from one part of it to another, we have made ourselves acquainted with the several particulars observable in it. If amongst these we find such as constitute some general idea, framed and settled beforehand by the understanding, and distinguished by a particular name, the resemblance thus known and perceived necessarily determines the species of the object, and thereby gives it a right to the name by which that species is called. Thus four equal sides, joined together at right angles, constitute the notion of a *square*. As this is a fixed and invariable idea, without which the general name cannot be applied, we never call any particular figure a *square* until it appears to have these several conditions; and, contrarily, wherever a figure is found to possess these conditions, it necessarily takes the name of a *square*. The same will be found to hold in all our other reasonings of this kind, where nothing can create any difficulty but the want of settled ideas. If, for instance, we have not determined within ourselves the precise notion denoted by the word *manslaughter*, it will be impossible for us to decide whether any particular action ought to bear that name; because, however nicely we may examine the action itself, yet, being strangers to the general idea with which it is to be compared, we are utterly unable to judge of their agreement or disagreement. But if we take care to remove this obstacle, and distinctly trace the two ideas under consideration, all difficulties vanish, and the resolution becomes both easy and certain.

8. Thus we see of what importance it is towards the improvement and certainty of human knowledge, that we should accustom ourselves to clear and determinate ideas, and to a steady application of words.

3. *Of Reasoning, as it regards the Powers and Properties of Things, and the Relations of our general Ideas.*

Distinction of reasoning, as it regards the sciences, and common life.

1. We now come to the second great end which men have in view in their reasonings; namely, the discovering and ascribing to things their several attributes and properties. And here it will be necessary to distinguish between reasoning, as it regards the sciences, and as it concerns common life. In the sciences, our reason is employed chiefly about universal truths, because by these alone are the bounds of human knowledge enlarged. Hence the division of things into various classes, called otherwise *genera* and *species*. For these universal ideas being set up as the representatives of many particular things, whatever is affirmed of them may be also affirmed of all the individuals to which they belong. *Murder*, for instance, is a general idea, representing a certain species of human actions. Reason tells us that the punishment due to it is *death*. Hence every particular action, coming under the notion of *murder*, has the punishment of *death* allotted to it. Here then we apply the general truth to some obvious instance, and this is what properly constitutes the reasoning of common life; for men, in their ordinary transactions and intercourse with one another, have, for the most part, to do only with particular objects. Our friends and relations, their characters and behaviour, the constitution of the several bodies that surround us, and the uses to which they may be applied, are what chiefly engage our attention. In all these, we reason about particular things; and the whole result of our reasoning is, the applying the general truths of the sciences in the ordinary transactions of human life. When we see a viper, we avoid it. Wherever we have occasion for the forcible action of water to move a body which makes considerable resistance, we take care to convey it in such a manner that it shall fall upon the object with impetuosity. Now all this happens in consequence of our familiar and ready application of these two general truths: "The bite of a viper is mortal;" "Water falling upon any body with impetus, acts very forcibly towards setting it in motion." In like manner, if we set ourselves to consider any particular character, in order to determine the share of praise or dispraise which belongs to it, our great concern is to ascertain exactly the proportion of virtue and vice. The reason is obvious. A just determination, in all cases of this kind, depends entirely upon an application of these general maxims of morality: "Virtuous actions deserve praise;" "Vicious actions deserve blame."

Steps i the reasoning commo life.

2. Hence it appears that reasoning, as it regards common life, is no more than the ascribing the general properties of things to those several objects with which we are more immediately concerned, according as they are found to be of that particular division or class to which the properties belong. The steps, then, by which we proceed, are manifestly these. First, we refer the object under consideration to some general idea or class of things. We then recollect the several attributes of that general idea. And, lastly, we ascribe all those attributes to the actual object. Thus, in considering the character of Sempronius, if we find it to be of the kind called *virtuous*, when we at the same time reflect that a virtuous character is deserving of esteem, it naturally and obviously follows that Sempronius is an estimable man. These thoughts put into a *syllogism*, in order to exhibit the form of reasoning here required, run thus: "Every virtuous man is worthy of esteem. Sempronius is a virtuous man: Therefore Sempronius is worthy of esteem."

Connection anc dependence o the two branche of reasoning.

3. By this *syllogism* it appears, that before we affirm anything of a particular object, that object must be referred to some general idea. Sempronius is pronounced worthy of esteem only in consequence of his being a virtuous man, or coming under that general notion. Hence we see the necessary connection of the various parts of reasoning, and the dependence which they have one upon another. The determining the genera and the species of things is, as we have said, one exercise of human reason; and here we find that this exercise is the first in order, and previous to the other, which consists in ascribing to them their powers, properties, and relations. But when we have taken this previous step, and brought particular objects under general names, as the properties we ascribe to them are no other than those of the general idea, it is plain that, in order to a successful progress in this part of knowledge, we must thoroughly acquaint ourselves with the several relations and attributes of these our general ideas. When this is done, the other part will be easy, and require scarcely any labour or thought, being no more than an application of the general form of reasoning represented in the foregoing syllogism. Now, as it has already been sufficiently shown how we are to proceed in determining the genera and species of things, which, as we have stated, is the previous step to this second branch of human knowledge, all that is further wanting towards a due explanation of it is, to offer some considerations as to the manner of investigating the general relations of our ideas. This is the highest exercise of the powers of the understanding, and that by means of which we arrive at the discovery of universal truths; insomuch that our deductions in this way constitute that particular species of reasoning which, we have before said, regards principally the sciences.

4. But, that we may conduct our thoughts with some degree of order and method, we shall begin with observing,

that the relations of our general ideas are of two kinds; either such as immediately discover themselves, upon comparing the ideas one with another; or such as, being more remote and distant, require art and contrivance to bring them into view. The relations of the first kind furnish us with intuitive and self-evident truths. Those of the second are traced by reasoning, and a due application of intermediate ideas. It is of the latter kind that we are to speak here, having despatched what was necessary with regard to the other in the second part. As, therefore, in tracing the more distant relations of things, we must always have recourse to intervening ideas, and are more or less successful in our researches, according to our acquaintance with these ideas, and ability in applying them; so it is evident that, to make a good reasoner, two things are principally required: *First,* An extensive knowledge of those intermediate ideas, by means of which things may be compared one with another; and, *secondly,* The skill and talent of applying them happily in all particular instances which come under consideration.

5. In order to our successful progress in reasoning, we must have an extensive knowledge of those intermediate ideas by means of which things may be compared one with another. For as it is not every idea that will answer the purpose of our inquiries, but only such as are peculiarly related to the objects about which we reason, so as, by a comparison with them, to furnish evident and known truths, nothing is more apparent than that, the greater variety of conceptions we can call into view, the more likely are we to find some amongst them which will help us to the truths here required. And, indeed, it is found to hold in experience, that in proportion as we enlarge our views of things, and grow acquainted with a multitude of different objects, the reasoning faculty gathers strength; for, by extending our sphere of knowledge, the mind acquires a certain force and penetration, as being accustomed to examine the several appearances of its ideas, and observe what light they throw upon one another.

6. This is the reason why, in order to excel remarkably in any one branch of learning, it is necessary to have at least a general acquaintance with the whole circle of the arts and sciences. The truth is, that all the various divisions of human knowledge are very nearly related amongst themselves, and, in innumerable instances, serve to illustrate and set off one another. And although it is not to be denied that, by an obstinate application to one branch of study, a man may make considerable progress, and acquire some degree of eminence in it, yet his views will always be narrow and contracted, and he will want that masterly discernment which not only enables us to pursue our discoveries with ease, but also, in laying them open to others, to spread a certain brightness around them. But when our reasoning regards a particular science, it is further necessary that we should more nearly acquaint ourselves with whatever relates to that science. A general knowledge is a good preparation, and enables us to proceed with ease and expedition in whatever branch of learning we apply to. But then, in the minute and intricate questions of any science, we are by no means qualified to reason with advantage until we have perfectly mastered the science to which they belong.

7. We come now to the second thing required in order to a successful progress in reasoning; namely, the skill and talent of applying intermediate ideas happily in all particular instances that come under consideration. And here rules and precepts are of little service. Use and experience are the best instructors. For, however logicians may boast of being able to form perfect reasoners by book and rule, we find by experience that the study of their precepts does not always add any great degree of strength to the understanding. In short, it is the habit alone of reasoning that makes a reasoner; and therefore the true way to acquire this talent is, by being much conversant in those sciences where the art of reasoning requires to be exercised in the greatest perfection. Hence it was that the ancients, who so well understood the manner of forming the mind, always began with *mathematics* as the foundation of their philosophical studies. In this pursuit the understanding is by degrees habituated to truth, it contracts insensibly a certain fondness for it, and learns never to yield its assent to any proposition but where the evidence is sufficient to produce full conviction. For this reason Plato has called mathematical demonstrations the *cathartics* or purgatives of the soul, as being the proper means of cleansing it from error, and restoring that natural exercise of its faculties in which just thinking consists.

Value of mathematical demonstrations.

8. If, therefore, we would form our minds to a habit of reasoning closely and in train, we cannot take any more certain method than that of exercising ourselves in mathematical demonstrations, so as to contract a kind of familiarity with them. Not that we look upon it as necessary that all men should be deep mathematicians; but that, having mastered the way of reasoning which that study necessarily brings the mind to, they may be able to transfer it to other parts of knowledge, as they shall afterwards have occasion.

Value of authors distinguished for strength and justness of reasoning.

9. But though the study of mathematics be of all others the most useful to form the mind, and to give it an early relish for truth, yet other parts of philosophy ought not to be neglected. For there also we meet with many opportunities of exercising the powers of the understanding; and the variety of subjects naturally leads us to observe all those different turns of thinking which are peculiarly adapted to the several ideas we examine, and the truth we search after. A mind thus trained acquires a certain mastery over its own thoughts, insomuch that it can arrange and model them at pleasure, and call such into view as best suit its actual designs. Now in this consists the whole art of reasoning; from amongst a great variety of different ideas to single out those which are most proper for the business in hand, and to lay them together in such order, that from plain and easy beginnings, by gentle degrees, and a continued train of evident truths, we may be insensibly led on to such discoveries as at our first setting out would appear beyond the reach of human understanding. For this purpose, besides the study of mathematics already recommended, we should apply ourselves diligently to the reading of such authors as have distinguished themselves for strength of reasoning, and a just and accurate manner of thinking; for it is observable, that a mind exercised and seasoned to truth seldom rests satisfied with the bare contemplation of the arguments offered by others, but will be frequently essaying its own strength, and pursuing its discoveries upon the plan which it is most accustomed to. Thus we insensibly contract a habit of tracing truth from one stage to another, and of investigating those general relations and properties which we afterwards ascribe to particular things, according as we find them comprehended under the abstract ideas to which the properties belong.

4. *Of the Forms of Syllogisms.*

Figures of syllogisms.

1. Hitherto we have contented ourselves with giving a general notion of syllogisms, and of the parts of which they consist. It is now time to enter a little more particularly into the subject, to examine their various forms, and to lay down the rules of argumentation proper to each. In the syllogisms mentioned in the foregoing chapters, we may observe, that the *middle term* is the subject of the *major* proposition, and the predicate of the *minor*. This disposition, though the most natural and obvious, is not, however, necessary, as it frequently happens that the middle

B is b
A is B
∴ A is b

term is the subject in both the premises, or the predicate in both; and sometimes, directly contrary to its disposition in the foregoing chapters, it is the predicate in the major, and the subject in the minor. Hence the distinction of syllogisms into various kinds, called *figures* by logicians; for figure, according to their use of the word, is nothing else but the order and disposition of the middle term in any syllogism. And as this disposition is, as we have shown, fourfold, so the figures of syllogisms thence arising are four in number. When the middle term is the subject of the major proposition, and the predicate of the minor, we have what is called the *first figure;* as, "No work of God is bad: The natural passions and appetites of men are the work of God: Therefore none of them is bad." If, on the other hand, it is the predicate of both the premises, the syllogism is said to be the *second figure*; as, "Whatever is bad is not the work of God: All the natural passions and appetites of men are the work of God: Therefore the natural passions and appetites of men are not bad." Again, in the *third figure*, the middle term is the subject of the two premises: as, "All Africans are black: All Africans are men: Therefore some men are black." And, lastly, by making it the predicate of the major, and subject of the minor, we obtain syllogisms in the *fourth figure;* as, "The only Being who ought to be worshipped is the Creator and Governor of the world: The Creator and Governor of the world is God: Therefore God is the only Being who ought to be worshipped."

Moods of syllogisms.

2. But, besides this fourfold distinction of syllogisms, there is also a further subdivision of them in every figure, arising from the *quantity* and *quality*, as they are called, of the propositions. By quantity we mean the consideration of propositions, as universal or particular; by quality, as affirmative or negative.

Now as, in all the several dispositions of the middle term, the propositions of which a syllogism consists may be either universal or particular, affirmative or negative, the due determination of these, and the putting them together as the laws of argumentation require, constitute what logicians call the *moods* of syllogisms. Of these moods there is a determinate number to every figure, including all the possible ways in which propositions differing in quantity or quality can be combined, according to any disposition of the middle term, in order to arrive at a just conclusion.

The first figure has only four legitimate moods. The major proposition in this figure must be universal, and the minor affirmative; and it has this property, that it yields conclusions of all kinds, affirmative and negative, universal and particular.

The second figure has also four legitimate moods. Its major proposition must be universal, and one of the premises must be negative. It yields conclusions both universal and particular, but all negative.

The third figure has six legitimate moods. Its minor must always be affirmative; and it yields conclusions both affirmative and negative, but all particular. These are all the figures which were admitted by the inventor of syllogisms, and of which, so far as we know, the number of legitimate moods has been ascertained, and severally demonstrated. In *every figure* it will be found upon trial that there are *sixty-four* different moods of syllogism; and he who thinks it worth while to construct so many in the *fourth* figure, always remembering that the *middle term* in each must be the *predicate* of the *major* and the *subject* of the *minor* proposition, will easily discern what number of these moods are *legitimate*, and evolve true conclusions.

Besides the rules which are proper to each figure, Aristotle has given some that are common to all, by which the legitimacy of syllogisms may be tried. These may be reduced to five, viz. 1. There must be only *three terms* in a syllogism; and as each term occurs in two of the propositions, it must be precisely the *same in both;* for if it be *not*, the syllogism is said to have *four terms*, which makes a *vicious* syllogism. 2. The *middle term* must be taken *universally* in *one* of the premises. 3. Both premises must *not be particular* propositions, nor both *negative.* 4. The *conclusion* must be *particular*, if *either* of the *premises* be *particular;* and *negative*, if *either* of the *premises* be *negative.* 5. No term can be taken *universally* in the *conclusion*, if it be *not* taken *universally* in the *premises.* For understanding the *second* and *fifth* of these rules, it is necessary to observe, that a term is said to be taken *universally*, not only when it is the *subject* of a *universal* proposition, but also when it is the *predicate* of a *negative* proposition; and, on the other hand, a term is said to be taken *particularly*, when it is either the *subject* of a *particular* or the *predicate* of an *affirmative* proposition.

Foundation of t other di sion of s logisms.

3. The division of syllogisms according to moods and figures respects those especially which are known by the name of plain simple syllogisms; that is, which are limited to three propositions, all of them simple, and where the extremes and middle term are connected, according to the rules above laid down. But as the mind is not tied down to any one precise form of reasoning, but sometimes makes use of more, sometimes of fewer premises, and often employs compound and conditional propositions, it may not be amiss to take notice of the different forms derived from this source, and explain the rules by which the mind conducts itself in the use of them.

Conditio syllogism

4. When in any syllogism the major is a conditional proposition, the syllogism itself is termed *conditional.* Thus: "If there be a God, he ought to be worshipped: But there is a God: Therefore he ought to be worshipped." In this example the major or first proposition is, we see, conditional, and therefore the syllogism itself is also of the kind called conditional. And here we must observe, that all conditional propositions are composed of two distinct parts; one expressing the condition upon which the predicate agrees or disagrees with the subject, as in this now before us, *If there be a God;* and the other joining or disjoining the said predicate and subject, as here, *he ought to be worshipped.* The first of these parts, or that which implies the condition, is called the *antecedent;* the second, where we join or disjoin the predicate and subject, receives the name of the *consequent.*

Ground relation i condition syllogism

5. In all propositions of this kind, supposing them to be exact in point of form, the relation between the antecedent and consequent must ever be true and real; that is, the antecedent must always contain some certain and genuine condition, which necessarily implies the consequent; for otherwise the proposition itself will be false, and therefore ought not to be admitted into our reasonings. Hence it follows, that when any conditional proposition is assumed, if we admit the antecedent of that proposition, we must at the same time necessarily admit the consequent; but if we reject the consequent, we are in like manner bound to reject the antecedent. For as the antecedent always expresses some condition which necessarily implies the truth of the consequent, by admitting the antecedent, we allow of that condition, and therefore ought also to admit the consequent. In like manner, if it appear that the consequent ought to be rejected, the antecedent must evidently be so too; because, as has just been demonstrated, the admission of the antecedent would necessarily imply the admission likewise of the consequent.

Two moods of condition syllogism

6. There are two ways of arguing in *hypothetical* syllogisms, which lead to a certain and unavoidable conclusion; for, as the major is always a conditional proposition, consisting of an antecedent and a consequent, if the

minor admit the antecedent, it is plain that the conclusion must admit the consequent. This is called arguing from the admission of the antecedent to the admission of the consequent, and constitutes that mood or species of hypothetical syllogisms which is distinguished in the schools by the name of the *modus ponens*, inasmuch as by it the whole conditional proposition, both antecedent and consequent, is established. Thus: "If God is infinitely wise, and acts with perfect freedom, he does nothing but what is best: But God is infinitely wise, and acts with perfect freedom: Therefore he does nothing but what is best."

Here we see that the antecedent or first part of the conditional proposition is established in the minor, and the consequent or second part in the conclusion; whence the syllogism itself is an example of the *modus ponens*. But if, on the contrary, we suppose that the minor rejects the consequent, then it is apparent that the conclusion must also reject the antecedent. In this case we are said to argue from the removal of the consequent to the removal of the antecedent, and the particular mood or species of syllogisms thence arising is called by logicians the *modus tollens*, because in it both antecedent and consequent are rejected or taken away. This will appear by the following example: "If God were not a Being of infinite goodness, neither would he consult the happiness of his creatures: But God does consult the happiness of his creatures: Therefore he is a Being of infinite goodness."

7. These two species include the whole class of conditional syllogisms, and all the possible ways of arguing which lead to a legitimate conclusion; because we cannot here proceed by a contrary process of reasoning, that is, from the removal of the antecedent to the removal of the consequent, or from the establishing of the consequent to the establishing of the antecedent. For, although the antecedent always expresses some real condition, which, once admitted, necessarily implies the consequent, yet it does not follow that there is therefore no other condition; and if so, then, after removing the antecedent, the consequent may still hold, because of some other determination which infers it. When we say, "If a stone be exposed some time to the rays of the sun, it will contract a certain degree of heat," the proposition is certainly true; and, admitting the antecedent, we must also admit the consequent. But as there are various other ways by which a stone may become heated, it will not follow, from the ceasing of the before-mentioned condition, that therefore the consequent cannot take place. In other words, we cannot argue, "But the stone has not been exposed to the rays of the sun; therefore neither has it any degree of heat;" inasmuch as there are a great many other ways by which heat might have been communicated to it. And if we cannot argue from the removal of the antecedent to the removal of the consequent, no more can we argue from the admission of the consequent to the admission of the antecedent; because, as the consequent may flow from a great variety of different suppositions, the allowing of it does not determine the precise supposition, but only that some one of them must take place. Thus, in the foregoing proposition, "If a stone be exposed some time to the rays of the sun, it will contract a certain degree of heat;" admitting the consequent, viz. *that it has contracted a certain degree of heat*, we are not therefore bound to admit the antecedent, *that it has been some time exposed to the rays of the sun*, because there are many other sources whence that heat may have proceeded. These two ways of arguing, therefore, hold not in conditional syllogisms.

8. As from the major being a conditional proposition, we obtain the species of conditional syllogisms; so, where it is a disjunctive proposition, the syllogism to which it belongs is also called *disjunctive*, as in the following example: "The world is either self-existent, or the work of some finite, or of some infinite Being: But it is not self-existent, nor the work of a finite Being: Therefore it is the work of an infinite Being."

Manner of arguing disjunctive syllogisms.

Now, a disjunctive proposition is that where, of several predicates, we affirm one necessarily to belong to the subject, to the exclusion of all the rest, but leave that particular one undetermined. Hence it follows, that as soon as we determine the particular predicate, all the rest are of course to be rejected; or if we reject all the predicates but one, that one necessarily becomes effectual. When, therefore, in a disjunctive syllogism, the several predicates are enumerated in the major, if the minor establishes any one of these predicates, the conclusion ought to remove all the rest; or if, in the minor, all the predicates but one be removed, the conclusion must necessarily establish that one. Thus, in the disjunctive syllogism given above, the major affirms one of the three predicates to belong to the world, viz. *self-existence*, or that it is *the work of a finite*, or that it is *the work of an infinite Being*. Two of these predicates are removed in the minor, viz. *self-existence*, and *the work of a finite being*. Hence the conclusion necessarily ascribes to it the third predicate, and affirms that it is *the work of an infinite Being*. If now we give the syllogism another turn, insomuch that the minor may establish one of the predicates, by affirming the earth to be *the production of an infinite Being*, then the conclusion must remove the other two, asserting it to be neither *self-existent*, nor *the work of a finite Being*. These are the forms of reasoning in such species of syllogisms, the justness of which appears at first sight; and that there can be no other, is evident from the very nature of a disjunctive proposition.

Imperfect or mutilated syllogisms.

9. In the several kinds of syllogisms hitherto mentioned, we may observe that the parts are complete; that is, the three propositions of which they consist are represented in form. But it often happens that some one of the premises is not only an evident truth, but also familiar and in the minds of all men, in which case it is usually omitted, whereby we have an imperfect syllogism, which seems to be made up of only two propositions. Should we, for instance, argue in this manner: "Every man is mortal: Therefore every king is mortal:" the syllogism appears to be imperfect, as consisting but of two propositions. Yet it is really complete; only the minor [*every king is a man*] is omitted, and left to the reader to supply, as being a proposition so familiar and evident that it cannot escape him.

Enthymemes.

10. These seemingly imperfect syllogisms are called *enthymemes*,[1] and occur very frequently in reasoning, especially where it forms a part of common conversation. Nay, there is a particular elegance in them, because, not displaying the argument in all its parts, they leave somewhat to the exercise and invention of the mind. By this means we are put upon exerting ourselves, and even seem to share in the discovery of what is proposed to us. Now this is the great secret of fine writing, so to frame and put together our thoughts as to give full play to the reader's imagination, and draw him insensibly into our very views and course of reasoning. This gives a pleasure not unlike to that which the author himself feels in composing. Besides, it shortens discourse, and adds a certain force and liveliness to our arguments, when the words in which they are conveyed favour the natural quickness of the mind in

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[1] Respecting the prevalent mistake relative to the *Enthymeme*, and Aristotle's doctrine concerning it, see *Edinburgh Review*, vol. lvii. p. 221, et seq.

its operations, and a single expression is left to exhibit a whole train of thoughts.

Ground of reasoning in immediate consequences.

11. But there is another species of reasoning with two propositions, which seems to be complete in itself, and where we admit the conclusion without supposing any tacit or suppressed judgment in the mind, from which it follows syllogistically. This happens between propositions where the connection is such that the admission of the one necessarily and at the first sight implies the admission also of the other; for if it so happens that the proposition upon which the other depends is self-evident, we content ourselves with barely affirming it, and infer the other by a direct conclusion. Thus, by admitting an universal proposition, we are forced also to admit of all the particular propositions comprehended under it, this being the very condition which constitutes a proposition universal. If then that universal proposition chance to be self-evident, the particular ones follow of course, without any further train of reasoning. Whoever allows, for instance, *that things equal to one and the same thing are equal to one another*, must at the same time allow, *that two triangles, each equal to a square whose side is three inches, are also equal between themselves*. This argument, therefore, "Things equal to one and the same thing, are equal to one another: Therefore these two triangles, each equal to the square of a line of three inches, are equal between themselves," is complete in its kind, and contains all that is necessary towards a just and legitimate conclusion. For the first or universal proposition is self-evident, and therefore requires no further proof. And as the truth of the particular is inseparably connected with that of the universal, it follows from it by an obvious and unavoidable consequence.

All reducible to syllogisms of one form or another.

12. Now, in all cases of this kind, where propositions are deduced one from another, on account of a known and evident connection, we are said to reason by immediate consequence. Such a coherence of propositions, manifest at first sight, and forcing itself upon the mind, frequently occurs in reasoning. Logicians have explained at some length the several propositions in which it takes place, and allow of all immediate consequences which follow in conformity to them. It is however observable, that these arguments, though seemingly complete, because the conclusion follows necessarily from the single proposition which goes before, may yet be considered as real enthymemes, whose major, which is a conditional proposition, is wanting. The syllogism but just mentioned, when represented according to this view, will run as follows: "If things equal to one and the same thing are equal to one another, these two triangles, each equal to a square whose side is three inches, are also equal between themselves. But things equal to one and the same thing, are equal to one another: Therefore also these triangles, &c. are equal between themselves."

This observation will be found to hold in all immediate consequences whatsoever, insomuch that they are in fact no more than the enthymemes of hypothetical syllogisms. But then it is particular to them, that the ground on which the conclusion rests, namely, its coherence with the minor, is of itself apparent, and observed to flow immediately from the rules and reasons of logic.

A sorites of plain simple syllogisms.

13. The next species of reasoning we shall take notice of here is what is commonly known by the name of a *sorites*. This is a way of arguing, in which a great number of propositions are so linked together that the predicate of one becomes continually the subject of the next following, until at last a conclusion is formed, by bringing together the subject of the first proposition, and the predicate of the last. Of this kind is the following argument: "God is omnipotent: An omnipotent Being can do every thing that is possible: He that can do every thing that is possible, can do whatever involves not a contradiction: Therefore God can do whatever involves not a contradiction."

This particular combination of propositions may be continued to any length we please, without in the least weakening the ground upon which the conclusion rests. The reason is, because the sorites itself may be resolved into as many simple syllogisms as there are middle terms in it; and this is found universally to hold, That when such a resolution is made, and the syllogisms are placed in train, the conclusion of the last in the series is also the conclusion of the sorites. This kind of argument, therefore, as it serves to unite several syllogisms into one, must stand upon the same foundation with the syllogisms of which it consists, and is, indeed, properly speaking, no other than a compendious way of reasoning syllogistically.

A sorites of hypothetical syllogism

14. What is here said of plain simple propositions may be as well applied to those that are conditional; that is, any number of them may be so joined together in a series, that the consequent of one shall become continually the antecedent of the next following; in which case, by establishing the antecedent of the first proposition, we also establish the consequent of the last, or by removing the last consequent, remove also the first antecedent. This way of reasoning is exemplified in the following argument: "If we love any person, all emotions of hatred towards him cease: If all emotions of hatred towards a person cease, we cannot rejoice in his misfortunes: If we rejoice not in his misfortunes, we certainly wish him no injury: Therefore, if we love a person, we wish him no injury." It is evident that this sorites, as well as the last, may be resolved into a series of distinct syllogisms, with only this difference, that here the syllogisms are all conditional.

Ground o argumentation in dilemma.

15. The last species of syllogism which we shall take notice of under this head is that commonly distinguished by the name of a *dilemma*. A dilemma is an argument by which we endeavour to prove the absurdity or falsehood of some assertion. In order to this, we assume a conditional proposition, the antecedent of which is the assertion to be disproved, and the consequent a disjunctive proposition, enumerating all the possible suppositions upon which that assertion can take place. If then it appears, that all these several suppositions ought to be rejected, it is plain that the antecedent or assertion itself must be so too. When therefore such a proposition as that before mentioned is made the major of any syllogism, if the minor rejects all the suppositions contained in the consequent, it follows necessarily that the conclusion ought to reject the antecedent, which, as we have said, is the very assertion to be disproved. This particular way of arguing is that which logicians call a *dilemma;* and from the account here given of it, it appears that we may generally define it to be a hypothetical syllogism, where the consequent of the major is a disjunctive proposition, which is wholly taken away or removed in the minor. Of this kind is the following: "If God did not create the world perfect in its kind, it must either proceed from want of inclination or from want of power: But it could not proceed either from want of inclination or from want of power: Therefore he created the world perfect in its kind: Or, which is the same thing, It is absurd to say that he did not create the world perfect in its kind."

Universal description.

16. The nature, then, of a dilemma is universally this: The major is a conditional proposition, whose consequent contains all the several suppositions upon which the antecedent can take place. As therefore these suppositions are wholly removed in the minor, it is evident that the antecedent must be so too, insomuch that we here always argue from the removal of the consequent to the removal of the antecedent; that is, a dilemma is an argument in the *modus tollens* of hypothetical syllogisms, as logicians express it. Hence it is plain, that if the antecedent of

the major be an affirmative proposition, the conclusion of the dilemma will be negative; but if it be a negative proposition, the conclusion will be affirmative.

5. *Of Induction.*[1]

1. All reasoning is ultimately resolvable into first truths, which are either self-evident or taken for granted; and the first truths of syllogistic reasonings are *general* propositions. But, except in the mathematics, and such other sciences as, being conversant about mere ideas, have no immediate relation to things without the mind, we cannot assume as truths propositions which are general. The mathematician, indeed, may be considered as taking his ideas from the beginning in their *general* form. Every *proposition* composed of such ideas is therefore general; and those which are theoretical are reducible to two parts or *terms*, a *predicate* and a *subject*, with a *copula* generally affirmative. If the agreement or the relation between the two terms be not immediate and self-evident, he has recourse to an *axiom*, which is a proposition still *more general*, and which supplies him with a third or *middle term*. This he compares, first with the *predicate*, and then with the *subject*, or *vice versa*. These two comparisons, when drawn out in form, constitute two propositions, which are called the *premises;* and if they happen to be *immediate* and *self-evident*, the *conclusion*, consisting of the terms of the question proposed, is said to be demonstrated. This method of reasoning is conducted exactly in the syllogistic form explained in the preceding chapter.

2. But in sciences which treat of things external to the mind, we cannot assume as *first principles* the most general propositions, and from them infer others less and less general, till we descend to particulars. The reason is obvious. Every thing in the universe, whether of mind or body, presents itself to our observation in its individual state; so that *perception* and *judgment* employed in the investigation of truth, whether *physical, metaphysical, moral,* or *historical*, have in the first place to deal with *particulars.* With these reason begins, or should begin, its operations. It observes, tries, canvasses, examines, and compares them together, and judges of them by some of those native evidences and original lights which, as they are the first and indispensable inlets of knowledge to the mind, so they have been called the *primary principles of truth.* See METAPHYSICS.

3. By such acts of observation and judgment, diligently practised and frequently repeated, upon many *individuals* of the same class or of a similar nature, observing their agreements, marking their differences however minute, and rejecting all instances which, however similar in appearance, are not in effect the same, REASON, with much labour and attention, extracts some *general laws* respecting the powers, properties, qualities, actions, passions, virtues, and relations of *real things.* This is no hasty, premature, notional abstraction of the mind, by which images and ideas are formed which have no archetypes in nature; it is a rational, operative, experimental process, instituted and executed upon the constitution of beings, which in part compose the universe. By this process REASON advances from *particulars* to *generals*, from *less general* to *more general*, till, by a series of slow progression, and by regular degrees, it arrive at the *most general* notions, called FORMS, OR FORMAL CAUSES.[2] And by *affirming* or *denying* a genus of a species, or an accident of a substance or class of substances, through all the stages of the gradation, we form *conclusions*, which, if logically drawn, are AXIOMS,[3] or general propositions ranged one above another, till they terminate in those that are UNIVERSAL.

Of Reasoning.

The process of induction exemplified in physics.

4. Thus, for instance, *the evidence of the external senses* is obviously the PRIMARY PRINCIPLE from which all physical knowledge is derived. But, whereas nature begins with *causes*, which, after a variety of changes, produce *effects*, the senses open upon the *effects*, and from them, through the slow and painful road of experiment and observation, ascend to *causes.* By *experiments* and *observations* skilfully chosen, artfully conducted, and judiciously applied, the philosopher advances from one stage of inquiry to another in the rational investigation of the *general causes* of physical truth. From different experiments and observations made on the same individual subject, and from the same experiments and observations made on different subjects of the same kind, by comparing and judging, he discovers some *qualities, causes,* or *phenomena*, which, after carefully distinguishing and rejecting all contradictory instances that occur, he finds common to *many.* Thus, from many collateral comparisons and judgments formed upon *particulars* he ascends to *generals;* and by a repetition of the same industrious process and laborious investigation, he advances from *general* to *more general*, till at last he is enabled to form a few of the *most general*, with their attributes and operations, into AXIOMS or *secondary principles*, which are the well-founded *laws* enacted and enforced by the God of nature. This is that just and philosophic method of reasoning which sound logic prescribes in this as well as in other parts of learning; by which, through the slow but certain road of experiment and observation, the mind ascends from appearances to qualities, from effects to causes, and, from experiments upon many particular subjects, forms *general propositions* concerning the powers and properties of physical body.

Axioms applicable to all parts of learning.

5. AXIOMS so investigated and established are applicable to all parts of learning, and constitute the indispensable, and indeed the wonderful expedients, by which, in every branch of knowledge, reason pushes on its inquiries in the particular pursuit of truth; and the method of reasoning

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[1] On the distinction of *logical* and *real induction*, a distinction hitherto wholly overlooked, see *Edinburgh Review*, vol. lvii. p. 224, et seq.

[2] "Qui *formas* novit, is, quæ adhuc non facta sunt, qualia nec naturæ vicissitudines, nec experimentales industriæ unquam in actum produxissent, nec cogitationem humanam subituræ fuissent, detegit et educit." (Baconi *Novum Organon.*)

[3] The word axiom, ἀξίωμα, literally signifies *dignity.* Hence it is used metaphorically to denote a *general truth* or maxim, and sometimes any truth that is self-evident, which is called a *dignity* on account of its importance in a process of reasoning. The axioms of Euclid are propositions extremely general; and so are the axioms of the Newtonian philosophy. But these two kinds of axioms have very different origins. The former appear true upon a bare contemplation of our ideas; whereas the latter are the result of the most laborious induction. Lord Bacon, therefore, strenuously contends that they should never be taken upon conjecture, or even upon the authority of the learned; but that, as they are the general principles and grounds of all learning, they should be canvassed and examined with the most scrupulous attention, "ut axiomatum corrigatur iniquitas, quæ plerumque in exemplis vulgatis fundamentum habent." (*De Augm. Scient.* lib. ii. cap. 2.) "Atque illa ipsa putativa principia ad rationes reddendas compellare decrevimus, quousque plane constant." (*Distrib. Operis.*) Dr Tatham makes a distinction between axioms *intuitive* and axioms *self-evident. Intuitive* axioms, according to him, pass through the first inlets of knowledge, and flash direct conviction on the minds, as external objects do on the senses, of all men. Other axioms, though not intuitive, may be properly said to be *self-evident*, because, in their formation, reason judges by single comparisons, without the help of a third idea or middle term, so that they have their evidence in themselves, and, though inductively framed, they cannot be syllogistically proved. If this distinction be just, and we think it is, only *particular* truths can be intuitive axioms.

by which they are formed is that of true and legitimate INDUCTION, which is therefore by Lord Bacon, the best and soundest of logicians, called the *key of interpretation.*

6. Instead of taking his axioms arbitrarily out of the great families of the categories, and erecting them by his own sophistical invention into the principles upon which his disputation was to be employed, had the analytical genius of Aristotle presented us with the laws of the true INDUCTIVE LOGIC, by which AXIOMS are philosophically formed, and had he with his usual sagacity given us an example of it in a single branch of science, he would have brought to the temple of truth an offering more valuable than he has done by the aggregate of all his logical and philosophical productions.

Induction prior to definition.

7. In all sciences, excepting the mathematics, it is only after the INDUCTIVE process has been industriously pursued and successfully performed, that DEFINITION may be logically and usefully introduced, by beginning with the *genus*, passing through all the graduate and subordinate stages, and marking the *specific difference* as it descends, till it arrive at the *individual*, which is the subject of the question. And by adding an *affirmation* or *negation* of the attribute of the *genus* or the *species* or *individual*, or of a general *accident* on the particular *substance* so defined, making the definition a proposition, the truth of the question will be logically solved, without any further process. So that, instead of being the *first*, as employed by the logic in common use, *definition* may be the *last* act of reason in the search of truth in general.

Prior also to syllogism.

8. These AXIOMS or general propositions, thus *inductively* established, become another species of PRINCIPLES, which may be properly called SECONDARY, and which lay the foundation of the syllogistic method of reasoning. When these are formed, but not before, we may safely admit the maxim with which logicians set out in the exercise of their art, as the great hinge on which their reasoning and disputation turn: "From truths that are already known, to deduce others which are not known;" or, to state it more comprehensively, so as to apply to probable as well as to scientific reasoning, "From truths which are better known, to deduce others which are less known." Philosophically speaking, syllogistic reasoning is, under *general propositions,* to reduce others which are *less general*, or which are *particular;* for the *inferior* ones are known to be true, only as we trace their connection with the *superior*. Logically speaking, it is to predicate a *genus* of a *species* or *individual* comprehended under it, or an *accident* of the *substance* in which it is inherent.

Induction and syllogism totally different.

9. Thus INDUCTION and SYLLOGISM are the two methods of *direct reasoning* corresponding to the two kinds of principles, *primary* and *secondary*, on which they are founded, and by which they are respectively conducted. In both methods, indeed, reason proceeds by *judging* and *comparing*, but the process is different throughout; and though it may have the sanction of Aristotle, an *inductive syllogism* is a solecism.

Induction the foundation of syllogism.

10. Till general truths are ascertained by induction, the *third* or *middle terms* by which syllogisms are made are nowhere safely to be found. So that another position of the Stagirite, *that syllogism is naturally prior in order to induction,*[1] is equally unfounded; for *induction* does not only naturally but necessarily precede *syllogism*, and, except in mathematics, is in every repect indispensable to its existence; since, till generals are established, there can be neither *definition, proposition,* nor *axiom*, and of course no syllogism. And as induction is the first, so is it the more *essential* and fundamental instrument of reasoning; for as syllogism cannot produce its own *principles*, it must have them from induction; and if the general propositions or secondary principles be imperfectly or infirmly established, and much more, if they be taken at hazard, upon authority, or by arbitrary assumption like those of Aristotle, all the syllogizing in the world is a vain and useless logomachy, and only instrumental in the multiplication of false learning, and the invention and confirmation of error. The truth of syllogisms depends ultimately on the truth of axioms, and the truth of axioms on the soundness of inductions.[2] But though induction is prior in order, as well as superior in utility, to syllogism, we have thought it expedient to treat of it last; both because syllogism is an easier exercise of the reasoning faculty than induction, and because it is the method of mathematics, the first science of reason in which the student is commonly initiated.

6. *Of Demonstration.*

1. Having concluded all that seemed necessary to be said in regard to the two methods of direct reasoning, the *syllogistic* and *inductive*, we now proceed to consider the laws of demonstration. And here it must be acknowledged, that in strict demonstration, which removes from the mind all possibility of doubt or error, the inductive method of reasoning can have no place. When the experiments and observations from which the general conclusion is drawn are numerous and extensive, the result of this mode of reasoning is moral certainty; and if the induction could be made complete, it would be absolute certainty, equally convincing with mathematical demonstration. But however numerous and extensive the observations and experiments may be upon which an inductive conclusion is established, they must of necessity fall short of the number and extent of nature; which, in some cases, by its immensity, will defeat all possibility of their co-extension, whilst, in others, by its distance, it lies out of the reach of their immediate application. Though truth does not appear in all other departments of learning with that bold and resistless conviction with which it presides in the mathematical sciences, it shines through them all, if not interrupted by prejudice or perverted by error, with a clear and an useful though inferior certainty. And as it is not necessary for the general safety or convenience of a traveller, that he should always enjoy the heat and splendour of a mid-day sun, whilst he can with more ease pursue his journey under the milder influence of a morning or an evening sky; so it is not requisite, for the various concerns and purposes of life, that men should be led by truth of the most redundant brightness. Such truth is to be had only in those sciences which are conversant about abstract ideas of space and number, and their various relations, where every thing being certainly what it appears to be, definitions and axioms arise from mere intuition. Here *syllogism* takes up the process from the beginning, and by a sublime intellectual motion advances from the simplest axioms to the most complicated speculations, and exhibits truth springing out of its first and

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[1] This is a sad misrepresentation of Aristotle's doctrine. He makes the *deductive syllogism* prior in the *order of nature* to the *inductive syllogism*, as he makes the *state* in the same order prior to the *family*, and the family prior to the *individual*. But he expressly declares that the highest principles from which, in the syllogism proper, the deduction is made, are all the results of a foregone induction. The error arises from ignorance of the difference of a priority in the order of *nature* and *intention*, and priority in the order of *time* and *execution*.

[2] This chapter is almost wholly taken from Tatham's *Chart and Scale of Truth;* a work which, notwithstanding the ruggedness of its style, has so much real merit as a system of logic, that it cannot be too diligently studied by the young inquirer who wishes to travel by the straight road to the temple of science.

purest elements, and spreading upon all sides into a system of science. As each step in the progress is syllogistic, we shall endeavour to explain the use and application of syllogisms in this species of reasoning.

We have seen, that in all the different appearances they assume, we still arrive at a just and legitimate conclusion. Now, it often happens, that the conclusion of one syllogism becomes a previous proposition in another; by which means great numbers of them are sometimes linked together in a series, and truths are made to follow one another in a train. And as in such a concatenation of syllogisms all the various modes of reasoning which are truly conclusive may be with safety introduced, hence it is plain, that in deducing any truth from its first principles, especially where it lies at a considerable distance from them, we are at liberty to combine all the different kinds of syllogisms above explained, according as they are found best suited to the end and purpose of our inquiries. When a proposition is thus, by means of syllogisms, collected from others more evident and known, it is said to be *proved;* so that, in general, we may define the proof of a proposition to be a syllogism, or series of syllogisms, collecting that proposition from known and evident truths. But more particularly, if the syllogisms of which the proof consists admit of no premises but definitions, self-evident truths, and propositions already established, then is the argument so constituted called a *demonstration;* whereby it appears that demonstrations are ultimately founded upon definitions and self-evident propositions.

2. All syllogisms whatsoever, whether compound, multiform, or defective, are reducible to plain simple syllogisms in some one of the four figures. But this is not all. Syllogisms of the first figure, in particular, admit of all possible conclusions; that is, in any propositions whatsoever, whether universal affirmatives or universal negatives, particular affirmatives or particular negatives, which fourfold division embraces all their varieties, the conclusion may be inferred by virtue of some syllogism in the first figure. By this means it happens that the syllogisms of all the other figures are reducible also to syllogisms of the first figure, and may be considered as standing on the same foundation with them. We cannot here demonstrate and explain the manner of this reduction, because it would too much swell the bulk of this article. It is sufficient to notice, that the thing is universally known and allowed amongst logicians, to whose writings we refer such as desire further satisfaction in this matter. This, then, being laid down, it is plain that any demonstration whatsoever may be considered as composed of a series of syllogisms, all in the first figure. For, since all the syllogisms that enter the demonstration are reducible to syllogisms of some one of the four figures, and since the syllogisms of all the other figures are further reducible to syllogisms of the first figure, it is evident that the whole demonstration may be resolved into a series of these last syllogisms. Let us now, then, if possible, discover the ground upon which the conclusion rests in syllogisms of the first figure; because, by so doing, we shall come at an universal principle of certainty, whence the evidence of demonstrations in all their parts may be ultimately deduced.

3. The rules, then, of the first figure are briefly these. The middle term is the subject of the major proposition, and the predicate of the minor. The major is always an universal proposition, and the minor always affirmative. Let us now see what effect these rules will have in reasoning. The major is an universal proposition of which the middle term is the subject, and the predicate of the conclusion the predicate. Hence it appears, that in the major the predicate of the conclusion is always affirmed or denied universally of the middle term. Again, the minor is an affirmative proposition, of which the subject of the conclusion is the subject, and the middle term the predicate. Here then the middle term is affirmed of the subject of the conclusion; that is, the subject of the conclusion is affirmed to be comprehended under, or to form a part of, the middle term. Thus, then, we see what is done in the premises of a syllogism of the first figure. The predicate of the conclusion is universally affirmed or denied of some idea. The subject of the conclusion is affirmed to be or to form a part of that idea. Hence it naturally and unavoidably follows, that the predicate of the conclusion ought to be affirmed or denied of the subject. To illustrate this by an example, we shall resume one of the syllogisms of the first figure. "Every creature possessed of reason and liberty is accountable for his actions: Man is a creature possessed of reason and liberty: Therefore man is accountable for his actions."

Of Reasoning.

Here, in the first proposition, the predicate of the conclusion, *accountableness*, is affirmed of all creatures possessed of reason and liberty. Again, in the second proposition, *man*, the subject of the conclusion, is affirmed to be or to form a part of this class of creatures. Hence the conclusion necessarily and unavoidably follows, viz. that man is accountable for his actions; because, if reason and liberty be that which constitutes a creature accountable, and man has reason and liberty, it is plain he has that which constitutes him accountable. In like manner, where the major is a negative proposition, or denies the predicate of the conclusion universally of the middle term, as the minor always asserts the subject of the conclusion to be or form a part of that middle term, it is no less evident that the predicate of the conclusion ought in this case to be denied of the subject; so that the ground of reasoning, in all syllogisms in the first figure, is manifestly this: Whatever may be affirmed universally of any idea, may be affirmed of every or any number of particulars comprehended under that idea. And again, Whatever may be denied universally of any idea, may be in like manner denied of every or any number of its individuals. These two propositions are called by logicians the *dictum de omni*, and *dictum de nullo;* and they are indeed the great principles of syllogistic reasoning, inasmuch as all conclusions whatsoever rest immediately upon them, or upon propositions deduced from them. But what adds greatly to their value is, that they are really self-evident truths, and such as we cannot gainsay without running into an express contradiction. To affirm, for instance, that *no man is perfect*, and yet to argue that *some men are perfect;* or to say, that *all men are mortal*, and yet that *some men are not mortal;* is to assert a thing to be and not to be at the same time.

Demonstration an infallible guide to truth and certainty.

4. And now we may affirm, that, in all syllogisms of the first figure, if the premises be true, the conclusion also must needs be true. If it be true that the predicate of the conclusion, whether affirmative or negative, agrees universally to some idea; and if it be also true that the subject of the conclusion is a part of or comprehended under that idea; then it necessarily follows, that the predicate of the conclusion agrees also to the subject. For to assert the contrary, would be to run counter to some one of the two principles before established; that is, it would be to maintain an evident contradiction. And thus we have come at last to the point we have been all along endeavouring to establish; namely, that every proposition which can be demonstrated is necessarily true. For as every demonstration may be resolved into a series of syllogisms all in the first figure, and as in any one of these syllogisms, if the premises are true, the conclusion must needs be so likewise, it evidently follows, that if all the several premises are true, all the several conclusions are so, and consequently also the conclusion of the last syllogism, which is always the proposition to be demonstrated. Now, that all the premises of a demonstration are true, will easily appear from the very

nature and definition of that form of reasoning. A demonstration, as we have said, is a series of syllogisms, all whose premises are either definitions, self-evident truths, or propositions already established. Definitions are identical propositions, in which we connect the description of an idea with the name by which we choose to have that idea called, and therefore as to their truth there can be no dispute. Self-evident propositions appear true of themselves, and leave no doubt or uncertainty in the mind. Propositions, before established, are no other than conclusions gained by one or more steps from definitions and self-evident principles, that is, from true premises, and therefore must needs be true. Hence all the previous propositions of a demonstration being thus manifestly true, the last conclusion, or proposition to be demonstrated, must likewise be so; so that demonstration not only leads to certain truth, but we have here also a clear view of the ground and foundation of that certainty. For as, in demonstrating, we may be said to do nothing more than combine a series of syllogisms together, all resting on the same basis, it is plain that one uniform ground of certainty runs through the whole, and that the conclusions are everywhere built upon some one of the two principles before established, as the foundation of all our reasoning. These two principles are easily reducible into one, and may be expressed thus: Whatever predicate, whether affirmative or negative, agrees universally to any idea, the same must needs agree to every or any number of individuals comprehended under that idea. And thus at length we have, according to our first design, reduced the certainty of demonstration to one simple and universal principle, which carries its own evidence along with it, and which is indeed the ultimate foundation of all syllogistic reasoning.

Rules of logic furnish a criterion for distinguishing truth from falsehood.

5. Demonstration, therefore, serving as an infallible guide to truth, upon so sure and unalterable a basis, we may now venture to assert, that the rules of logic furnish a sufficient criterion for the distinguishing between truth and falsehood. For since every proposition that can be demonstrated is necessarily true, he is able to distinguish truth from falsehood who can with certainty judge when a proposition is truly demonstrated. Now, a demonstration, as we have said, is nothing more than a concatenation of syllogisms, all the premises of which are definitions, self-evident truths, or propositions previously established. To judge, therefore, of the validity of a demonstration, we must be able to distinguish whether the definitions that enter into it are genuine, and truly descriptive of the ideas they are meant to exhibit; whether the propositions assumed without proofs as intuitive truths have really that self-evidence to which they lay claim; whether the syllogisms are drawn up in due form, and agreeably to the laws of argumentation; in fine, whether they are combined together in a just and orderly manner, so that no demonstrable propositions serve anywhere as premises unless they are the conclusions of previous syllogisms. Now, it is the business of logic, in explaining the several operations of the mind, fully to instruct us in all these points. It teaches the nature and end of definitions, and lays down the rules by which these ought to be framed. It unfolds the several species of propositions, and distinguishes the self-evident from the demonstrable. It delineates also the different forms of syllogisms, and explains the laws of argumentation proper to each. In fine, it describes the manner of combining syllogisms, so that they may form a train of reasoning, and lead to the successive discovery of truth. The precepts of logic, therefore, as they enable us to judge with certainty when a proposition is duly demonstrated, furnish a sure criterion for the distinguishing between truth and falsehood.

6. Perhaps it may be objected, that demonstration is a thing very rare and uncommon, as being the prerogative of but a few sciences, and therefore the criterion here given can be of no great use. But wherever, by the bare contemplation of our ideas, truth is discoverable, there also demonstration may be attained. Now that is an abundantly sufficient criterion which enables us to judge with certainty in all cases where the knowledge of truth comes within our reach; for with discoveries that lie beyond the limits of the human mind we have properly no sort of business or concern. When a proposition is demonstrated, we are certain of its truth. When, on the contrary, our ideas are such as have no visible connection or repugnance, and therefore furnish not the proper means of tracing their agreement or disagreement, there we are sure that scientifical knowledge is not attainable. But where there is some foundation of reasoning, which yet amounts not to the full evidence of demonstration, there the precepts of logic, by teaching us to determine aright the degree of proof, and discern what is still wanting to render it full and complete, enable us to make a due estimate of the measures of probability, and to proportion our assent to the grounds upon which the proposition stands. And this is all we can possibly arrive at, or even so much as hope for, in the exercise of faculties so imperfect and limited as ours.

Distinction of d monstration into direct an indirect.

7. Before we conclude this branch of the subject, it may not be improper to take notice of the distinction of demonstration into *direct* and *indirect*. A *direct demonstration* is, when, beginning with definitions, self-evident propositions, or known and admitted truths, we form a train of syllogisms, and combine them in an orderly manner, continuing the series through a variety of successive steps, until at last we arrive at a syllogism the conclusion of which is the proposition to be demonstrated. Proofs of this kind leave no doubt or uncertainty behind them; because, all the several premises being true, the conclusions must likewise be so, and of course the very last conclusion or proposition to be proved. The other species of demonstration is the *indirect*, or, as it is sometimes called, the *apogogical*. The manner of proceeding here is, by assuming a proposition which directly contradicts that which we mean to demonstrate; and thence, by a continued train of reasoning, in the way of a direct demonstration, deducing from it some absurdity or manifest untruth. For hereupon we conclude that the proposition assumed was false, and thence again, by an immediate consequence, that the proposition to be demonstrated is true. Thus Euclid, in his third book, having to demonstrate *that circles which touch one another inwardly have not the same centre*, assumes the direct contrary of this, viz. *that they have the same centre;* and thence, by an evident train of reasoning, proves *that a part is equal to the whole.* The supposition therefore leading to this absurdity he concludes to be false, viz. *that circles touching one another inwardly have the same centre;* and thence again immediately infers, *that they have not the same centre.*

Ground o reasoning in indirect demonstrations.

8. Now, because this manner of demonstration is accounted by some not altogether so clear and satisfactory, we shall therefore endeavour to show that it equally with the other leads to truth and certainty. Two propositions are said to be *contradictory* of one another, when that which is asserted to be in the one is asserted not to be in the other. Thus the propositions, "Circles that touch one another inwardly have the same centre," and "Circles that touch one another inwardly have not the same centre," are *contradictories*, because the second asserts directly the contrary of that which is asserted in the first. Now, in all contradictory propositions, this holds universally, that one of them is necessarily true, and the other necessarily false. For if it be true that circles which touch one another inwardly have not the same centre, it is unavoidably false that they have the same centre. On the other hand, if it be false that they have the same centre, it is necessarily true that they have not the same centre. Since, therefore, it is impossible for them both to be true or both false at

the same time, it unavoidably follows that one is necessarily true and the other necessarily false. This, then, being allowed, which indeed is self-evident, if any two contradictory propositions are assumed, and one of them can by a clear train of reasoning be demonstrated to be false, it necessarily follows that the other is true. For as the one is necessarily true, and the other necessarily false, when we come to discover which is the false proposition, we thereby know the other to be true.

9. Now this is precisely the manner of an indirect demonstration, as is evident from the account which has been given of it above. For there we assume a proposition directly contradictory of that which we mean to demonstrate; and, having by a continued series of proofs shown it to be false, we thence infer that it is contradictory, or that the proposition to be demonstrated is true. As, therefore, this last conclusion is certain and unavoidable, let us next inquire after what manner we come to be satisfied of the falsehood of the assumed proposition, that so no possible doubt may remain as to the force and validity of demonstrations of this kind. The manner, then, is plainly this: Beginning with the assumed proposition, we, by the help of definitions, self-evident truths, or propositions already established, continue a series of reasoning, in the way of a direct demonstration, until at length we arrive at some absurdity or known falsehood. Thus Euclid, in the example before mentioned, from the supposition that circles touching one another inwardly have the same centre, deduces the inference *that a part is equal to the whole.* Since, therefore, by a due and orderly process of reasoning we come at last to a false conclusion, it is manifest that all the premises cannot be true; for, were all the premises true, the last conclusion must likewise be so, by what has been before demonstrated. Now, as to all the other premises made use of in the course of reasoning, they are by supposition manifest and known truths, being either definitions, self-evident propositions, or truths previously established. The assumed proposition is that only as to which any doubt or uncertainty remains. That alone, therefore, can be false; and, indeed, from what has been already shown, it must unavoidably be so. And thus we see that, in indirect demonstrations, two contradictory propositions being laid down, one of which is demonstrated to be false, the other, which is always the proposition to be proved, must necessarily be true; so that here, as well as in the direct mode of proof, we arrive at a clear and satisfactory knowledge of truth.

10. This is universally the method of reasoning in all apogogical or indirect demonstrations. But if any proposition is assumed, from which, in a direct train of reasoning, we can deduce its contradictory, the proposition so assumed is false, and the contradictory one true. For if we suppose the assumed proposition to be true, then, since all the other premises that enter the demonstration are also true, we shall have a series of reasoning consisting wholly of true premises; and hence the last conclusion or contradictory of the assumed proposition must be true likewise; so that by this means we should have two contradictory propositions both true at the same time, which is manifestly impossible. The assumed proposition, therefore, whence this absurdity flows, must necessarily be false; and consequently its contradictory, which is here the proposition deduced from it, must be true. If, then, any proposition is proposed to be demonstrated, and we *assume* the *contradictory* of that proposition, and thence directly infer the proposition to be demonstrated, by this very means we know that the proposition so inferred is true. For, since from an assumed proposition we have deduced its contradictory, we are thereby certain that the assumed proposition must be false; and if so, then its contradictory, or that deduced from it, which in this case is the same with the proposition to be demonstrated, must be true.

Of Method.

Knowledge of the principles of logic necessary to judge of demonstration.

11. We have a curious instance of this in the twelfth proposition of the ninth book of the Elements. Euclid there proposes to demonstrate, *that in any series of numbers, rising from unity in geometrical progression, all the prime numbers that measure the last term in the series will also measure the next after unity.* In order to this, he assumes the contradictory of the proposition to be demonstrated, namely, *that some prime number measuring the last term in the series does not measure the next after unity;* and thence, by a continued train of reasoning, proves that it actually does measure it. Hereupon he concludes that the assumed proposition is false; and that that which is deduced from it, or its contradictory, which is the very proposition he proposed to demonstrate, is true. Now that this is a just and conclusive way of reasoning, seems abundantly manifest from what has been so clearly established above. Whence it appears how necessary some knowledge of the rules of logic is to enable us to judge of the force, justness, and validity of demonstrations. For though it is readily allowed that, by the mere strength of our natural faculties we can at once discern, that of two contradictory propositions, the one is necessarily true and the other necessarily false, yet when they are so linked together in a demonstration as that the one serves as a previous proposition whence the other is deduced, it does not so immediately appear, without some knowledge of the principles of logic, why that alone, which is collected by reasoning, ought to be embraced as true, and the other, whence it is collected, should be rejected as false.

This of itself sufficient to guard us against false reasoning.

12. Having thus sufficiently evinced the certainty of demonstration in all its branches, and shown the rules by which we ought to proceed in order to arrive at a just conclusion according to the various ways of arguing made use of, it is needless to enter upon a particular consideration of those several species of false reasoning which logicians distinguish by the name of *sophisms.* He who thoroughly understands the form and structure of a good argument, will of himself readily discern every deviation from it. And although *sophisms* have been divided into many classes, which are all called by sounding names, that carry in them much appearance of learning, yet are the errors themselves so very palpable and obvious, that it would be lost labour to write for a man capable of being misled by them. Here, therefore, we choose to conclude this part of logic, and shall in the next give some account of *Method,* which, though inseparable from reasoning, is nevertheless always considered by logicians as a distinct operation of the mind, because its influence is not confined to the mere exercise of the reasoning faculty, but extends in some degree to all the transactions of the understanding.

IV.—OF METHOD.

General remarks.

We have now done with the three first operations of the mind, whose office it is to search after truth, and enlarge the bounds of human knowledge. There is yet a fourth, which regards the disposal and arrangement of our thoughts, when we endeavour so to put them together that their mutual connection and dependence may be clearly seen. This is what logicians called *Method,* and place always the last in order in explaining the powers of the understanding, because it necessarily supposes a previous exercise of our other faculties, and that some progress has been made in knowledge, before we can exert it in any extensive degree.

2. In this view it is plain that we must be beforehand well acquainted with the truths which we are to combine together, otherwise, how could we discern their several connections and relations, or so dispose of them as their mutual dependence may require? But it often happens that

the understanding is employed, not in the arrangement and composition of known truths, but in the search and discovery of such as are unknown. And here the manner of proceeding is very different. We assemble at once our whole stock of knowledge relating to any subject, and, after a general survey of things, begin with examining them separately and by parts. Hence it comes to pass, that although at our first setting out we were only acquainted with some of the grander strokes and outlines of truth, by thus pursuing her through her several windings and recesses we gradually discover those more inward and finer touches whence she derives all her strength, symmetry, and beauty. And here it is that when, by a narrow scrutiny into things, we have unravelled any part of knowledge, and traced it to its first and original principles, insomuch that the whole frame and contexture of it lies open to the view of the mind; here it is that, taking it the contrary way, and beginning with these principles, we can so adjust and put together the parts as the order and method of science requires.

3. But as these things are best understood when illustrated by examples, let us suppose any machine, for instance a watch, presented to us, the structure and composition of which we are as yet unacquainted with, but want, if possible, to discover. The manner of proceeding, in this case, is, by taking the whole to pieces, and examining the parts separately one after another. When by such a scrutiny we have thoroughly informed ourselves of the frame and contexture of each, we then compare them together, in order to judge of their mutual action and influence. By this means we gradually trace out the inward make and composition of the whole, and come at length to discern how parts of such a form, and so put together as we found in unravelling and taking them asunder, constitute that particular machine called a *watch*, and contribute to all the several motions and phenomena observable in it. This discovery being made, we can take things the contrary way, and, beginning with the parts, so dispose and connect them as their several uses and structures require, until at length we arrive at the whole itself, from the unravelling of which those parts resulted.

Ground of the analytic and synthetic methods.

4. And as it is in tracing and examining the works of art, so is it in a great measure in unfolding any part of human knowledge; for the relations and mutual habitudes of things do not always immediately appear upon comparing them one with another. Hence we have recourse to intermediate ideas, and by means of them are furnished with those previous propositions which lead to the conclusion we are in quest of. And if it so happen that the previous propositions themselves are not sufficiently evident, we endeavour by new middle terms to ascertain their truth, still tracing things backwards in a continual series, until at length we arrive at some syllogism where the premises are first and self-evident principles. This being done, we become perfectly satisfied as to the truth of all the conclusions we have passed through, inasmuch as they are now seen to stand upon the firm and immoveable foundation of our intuitive perceptions. And as we arrived at this certainty by tracing things backwards to the original principles whence they flow, so may we at any time renew it by a directly contrary process, if, beginning with these principles, we carry the train of our thoughts forward until they lead us, by a connected chain of proofs, to the very last conclusion of the series.

Division of method into analytic and synthetic.

5. Hence it appears, that in disposing and putting together our thoughts, either for our own use, that the discoveries we have made may at all times lie open to the review of the mind, or where we mean to communicate and unfold these discoveries to others, there are two ways of proceeding equally within our choice; for we may propose the truths relating to any part of knowledge, as they presented themselves to the mind in the manner of investigation, carrying on the series of proofs in a reverse order, until they at last terminate in first principles; or, beginning with these principles, we may take the contrary way, and from them deduce, by a direct train of reasoning, the several propositions which we want to establish. This diversity in the manner of arranging our thoughts gives rise to the twofold division of method established amongst logicians; for method, according to their use of the word, is nothing else but the order and disposition of our thoughts relating to any subject. When truths are proposed and put together as they were or might have been discovered, this is called the *analytical method*, or the *method of resolution;* inasmuch as it traces things backwards to their source, and resolves knowledge into its first and elementary principles. When, on the other hand, they are deduced from these principles, and connected according to their mutual dependence, insomuch that the truths first in order tend always to the demonstration of those which follow, this constitutes what we call the *synthetical method*, or the *method of composition;* for here we proceed by gathering together the several scattered parts of knowledge, and combining them into one whole or system, in such manner that the understanding is enabled distinctly to follow truth through all her different stages and gradations.

The method of invention, and the method of science.

6. There is this further to be taken notice of in relation to these two species of method, that the first has also obtained the name of the *method of invention*, because it observes the order in which our thoughts succeed one another in the invention or discovery of truth. The other, again, is often denominated the *method of doctrine* or *instruction*, inasmuch as, in laying our thoughts before others, we generally choose to proceed in the synthetic manner, deducing them from their first principles. For we have to observe, that although there is great pleasure in pursuing truth in the method of investigation, because it places us in the condition of the inventor, and shows the particular train and process of thinking by which he arrived at his discoveries, yet it is not so well accommodated to the purposes of evidence and conviction. At our first setting out, we are commonly unable to divine where the analysis will lead us, insomuch, indeed, that our researches are for some time little better than a mere groping in the dark. And even after light begins to break in upon us, we are still obliged to make many reviews, and a frequent comparison of the several steps of the investigation amongst themselves. Nay, when we have unravelled the whole, and reached the very foundation upon which our discoveries stand, all our certainty, in regard to their truth, will be found in a great measure to arise from that connection which we are now able to discern between them and first principles, taken in the order of composition. But in the synthetical manner of disposing our thoughts, the case is quite different. For, as we here begin with the intuitive truths, and advance by regular deductions from them, every step of the procedure brings evidence and conviction along with it; so that, in our progress from one part of knowledge to another, we have always a clear perception of the ground upon which our assent rests. In communicating our discoveries to others, therefore, this method is apparently to be chosen, as it wonderfully improves and enlightens the understanding, and leads to an immediate perception of truth.

7. The logic which for so many ages kept possession of the schools, and was deemed the most important of the sciences, has long been condemned as a mere art of wrangling, of very little use in the search after truth. Attempts have been made to restore it to credit, but without success; and for a considerable time little or no attention whatever has been paid to the science of logic in the course of what is called a liberal education. As both extremes may be faulty, it should seem that we cannot conclude this

of short treatise more properly than with some general observations on the utility of this science.

V.—OF THE UTILITY OF LOGIC.

If Aristotle was not the inventor of logic, he was certainly the prince of logicians. The whole theory of syllogisms he claims as his own property, the fruit of much time and labour; and it is universally known that the later writers on the art have borrowed their materials almost entirely from his *Organon* and Porphyry's *Introduction*. But after men had laboured nearly two thousand years in search of truth by the help of syllogisms, Lord Bacon proposed the method of induction as a more effectual engine for that purpose; and since his days the science of logic has gradually and undeservedly fallen into disrepute.

To this effect a variety of causes have contributed. The syllogistic art is admirably calculated for wrangling; and by the schoolmen it was employed with but too much success to keep in countenance the absurdities of the scholastic philosophy. Under their management it produced numberless disputes and numberless sects, who fought against each other with much animosity, without gaining or losing ground; but it did nothing considerable for the benefit of human life, whilst the method of induction has improved arts and increased knowledge. It is no wonder, therefore, that the excessive admiration of Aristotle, which continued for so many ages, should end in an undue contempt; and that the high esteem of logic, as the grand engine of science, should at last make way for the too unfavourable opinion which now seems prevalent, of its being unworthy of a place in a liberal education. Men rarely leave one extreme without running into the opposite. They who think according to the fashion of the time, will be as prone to go into the present extreme as their grandfathers were to go into the former; and even they who in general think for themselves, when they are offended at the abuse of any thing, are too apt to entertain prejudices against the *thing itself*. "In practice," says Bishop Warburton,[1] "logic is more a *trick* than a *science*, formed rather to amuse than instruct. And in some sort we may apply to the art of syllogism what a man of wit says of rhetoric, that it only tells us how to *name* those tools which nature had before put into our hands. In the service of chicane, indeed, it is a mere juggler's knot, now fast, now loose; and the schools where this legerdemain was exercised in great perfection are full of the stories of its wonders." The authority of Warburton is great, but it may be counterbalanced by another, which, on subjects of this nature, is confessedly greater.

"Laying aside prejudice, whether fashionable or unfashionable, let us consider," says Dr Reid,[2] "whether logic is or may be made subservient to any good purpose. Its professed end is to teach men to think, to judge, and to reason with precision and accuracy. No man will say this is a matter of little importance; the only thing therefore that can admit of doubt is, whether it can be taught?

"To resolve this doubt, it may be observed, that our rational faculty is the gift of God, given to men in very different measures. Some have a large portion, some a less; and where there is a remarkable defect of the natural power, it cannot be supplied by any culture. But this natural power, even where it is the strongest, may lie dead for want of the means of improvement. Many a savage may have been born with as good faculties as a Newton, a Bacon, or an Aristotle; but their talents were buried by having never been put to use, whilst those of the philosophers were cultivated to the best advantage. It may likewise be observed, that the chief mean of improving our rational power, is the vigorous exercise of it in various ways, and on different subjects, by which the habit is acquired of exercising it properly. Without such exercise, and good sense over and above, a man who has studied logic all his life may be only a petulant wrangler, without true judgment or skill of reasoning in any science."

This must have been Mr Locke's meaning, when, in his Thoughts on Education, he says, "If you would have your son to reason well, let him read Chillingworth." The state of things is much altered since Locke wrote. Logic has been much improved chiefly by his writings; and yet much less stress is laid upon it, and much less time consumed in its study, than formerly. His counsel, therefore, was judicious and seasonable, viz. That the improvement of our reasoning powers is to be expected much more from an intimate acquaintance with the authors who reason best, than from studying voluminous systems of scholastic logic. But if he had meant, that the study of logic was of no use, nor deserved any attention, he surely would not have taken the pains to make so considerable an addition to it, by his *Essay concerning Human Understanding*, and by his *Thoughts on the Conduct of the Understanding;* nor would he have remitted his pupil to Chillingworth, the acutest logician as well as the best reasoner of his age.

It must indeed be confessed, that a man without knowing the rules of logic may acquire a habit of reasoning justly in *mathematics*, and perhaps in any other science. Good sense, good examples, and assiduous exercise, may bring a man to reason justly and acutely in his own profession without rules. But whoever thinks, that from this concession he may infer the inutility of logic, betrays by this inference a great want of sense; for he might as well infer that, because a man *may* go from Edinburgh to London by the way of Paris, therefore *any other* road is useless.

There is perhaps no art which may not be acquired in a very considerable degree, by example and practice, without reducing it to rules. But practice conjoined with rules may carry a man forward in his art farther and more quickly than practice without rules. Every ingenious artist knows the utility of having his art reduced to rules, and thereby rendered a science. By rules he is enlightened in his practice, and works with more assurance. They enable him sometimes to correct his own errors, and often to detect the errors of others; and he finds them of great use to confirm his judgment, to justify what is right, and to condemn what is wrong. Now mathematics are the *praxis* of *logic*. Through them we may perceive how the stated forms of syllogism are exemplified in one subject, namely, the predicament of quantity; and by marking the force of these forms as they are there applied, we may be enabled to apply them of ourselves elsewhere. Whoever, therefore, shall study mathematics with this view, will become not only by mathematics a more expert *logician*, and by logic a more rational *mathematician*, but a wise philosopher, and an acuter reasoner on all the possible subjects either of science or deliberation. But when mathematics, instead of being applied to this excellent purpose, are used, not to exemplify logic, but to supply its place, no wonder if logic should fall into contempt, and if mathematics, instead of furthering science, should become in fact an obstacle. For when men, knowing nothing of that reasoning which is *universal*, come to attach themselves for a series of years to a *single species*, a species wholly involved in *lines* and *numbers*, the mind becomes incapacitated for reasoning at large, and especially in the search of *moral truth*. The object of mathematics is *demonstration;* and whatever in

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[1] Introduction to Julian, &c.

[2] Appendix to Lord Kames's Sketch on the Principles and Progress of Reason.

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that science is not demonstration, is nothing, or at least below the regard of the geometrician. *Probability*, through its almost infinite degrees, from simple ignorance up to absolute certainty, is the *terra incognita* of the mathematician; and yet here it is that the great *business* of the human mind is carried on in the search and discovery of all the important truths which concern us as reasonable beings; and here too it is that all its *vigour* is exerted; for to proportion the assent to the probability accompanying every varying degree of moral evidence, requires the most enlarged and sovereign exercise of reason.

In reasonings of this kind, will any man pretend that it is of no use whatever to be well acquainted with the various powers of the mind by which we reason? Is it of no use to resolve the various kinds of reasoning into their simplest elements; and to discover, as far as we are able, the rules by which these elements are combined in judging and in reasoning? Is it of no use to mark the various fallacies in reasoning, by which even the most ingenious men have been led into error? It must surely betray great want of understanding to think these things useless or unimportant. Now these are the things which logicians have attempted; and which they have also executed, not indeed so completely as to leave no room for improvement, but in such a manner as to give very considerable aid to our reasoning powers. That the principles they have laid down with regard to definition and division, the conversion and opposition of propositions, and the general rules of reasoning, are not without use, is sufficiently apparent from the blunders daily committed by those who disdain to cultivate any acquaintance with them.

Although the art of categorical syllogism is confessedly little fitted for the discovery of unknown truths, it may yet be employed to excellent purposes, as it is perhaps the most compendious method of detecting a fallacy. A man in quest of unknown truths, must generally proceed, by the method of induction, from effects to causes; but he who as a teacher has to inculcate any system upon others, begins with one or more self-evident truths, and proceeds, in the way of demonstration, to the conclusion which he wishes to establish. Now every demonstration, as has been already observed, may be resolved into a series of syllogisms, of which the conclusion of the preceding always enters into the premises of that which follows; and if the first principles be clear and evident, and every syllogism in some legitimate mode and figure, the conclusion of the whole must infallibly be admitted. But when the demonstration is thus broken into parts, if we find that the conclusion of one syllogism will not, without altering the meaning of the terms, enter legitimately into the premises of that which should immediately follow; or, supposing it to make one of the premises of a *new* syllogism, if we find that the conclusion resulting from the whole series *thus* obtained, is different from that of the demonstration; we may, in either of these cases, rest assured that the author's reasoning is fallacious, and leads to error; and that if it carried an appearance of conviction before it was thus resolved into its elementary parts, this must have been owing to the inability of the mind to comprehend at *once* a long train of arguments. Whoever wishes to see the syllogistic art employed for this purpose, and to be convinced of the truth of what we have said respecting its utility, may consult the excellent writer recommended by Mr Locke, who, in places innumerable of his incomparable book, has, without pedantry, even in that pedantic age, made the happiest application of the rules of logic for unravelling the sophistry of his Jesuitical antagonist.

Upon the whole, then, although we readily acknowledge that much time was wasted by our forefathers in syllogistic wrangling, and what might with little impropriety be termed the *mechanical* part of logic, yet the art of forming and examining arguments is certainly an attainment not unworthy the ambition of a being whose highest distinction it is that he is endowed with reason.

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tions.

The preceding article was written at a period when some views in regard to the object and the end of logic were entertained in this country, which, in the present state of the science, would be regarded as incorrect. The influence of these views upon this treatise does not, however, affect its utility. They are observable more in the *definition* than in the *treatment* of the subject. It is, accordingly, sufficient to correct the former, by showing what is the true scope and peculiar province of logic, and to point out to the reader the more accessible sources to which he may resort.

The common error, in which Bacon participated, of identifying *logical* (formal) and *philosophical* (real) induction; and the errors of Locke in supposing that logic supplied any peculiar method of reasoning, and that syllogism was ever intended as an instrument of *discovery;* had afforded to these philosophers a ground on which they found no difficulty in demonstrating the comparative inutility of the whole logical system of Aristotle. Nor was the fallacy of their refutation soon exposed by detecting the defect in its foundation. On the contrary, in this country, and in some others, it was long admitted to be conclusive; and this admission in a great measure determined the mode in which the subject was treated by the greater number of those British authors who subsequently presented to the public what they denominated systems of logic. Instead of showing that this science was only undervalued for not effecting what it really did not propose to accomplish; instead of showing that the end which it does propose is of high importance, and is fully accomplished by this science, and by this science alone; and, instead of rigorously excluding from their systems all not necessarily conducive to this end; they, on the contrary, proposed to logic an end which no one science could possibly accomplish; and in attempting this, they transmuted the most certain, definite, and independent of the philosophical sciences, into a precarious assemblage of foreign, incoherent, and insecure materials. Logic was regarded as the doctrine which taught the art of using rightly our intellectual faculties in the acquisition of knowledge; but as the promise here necessarily stood in melancholy contrast with the performance, this false and exaggerated estimate of the science only contributed to sink still lower the humble opinion now entertained of its importance.

Logic may be defined *the science of the laws of thought, considered as thought.* This is the central notion towards which the various views of the science from Aristotle down wards gravitate; it is the one definition, in which others, apparently the most opposite, find their complement and reconciliation. This definition, however, requires some elucidation.

In the first place, logic is said to be conversant about *thought.* The term thought properly denotes a self-active or spontaneous operation of the mind upon its objects, and in opposition to those passive determinations by which these objects are originally received into the mind, or subsequently suggested to its view. Logic is thus confined to the discursive agency of mind in its three degrees of Apprehension, Judgment, and Reasoning, to the exclusion of the subordinate operations of perception, imagination, and memory. Those who limit the definition of logic to *Reasoning*, are incorrect, inasmuch as, though the laws of reasoning are the principal, they are not the adequate object of the science. Those also are wrong who make logic proximately conversant about *language*, thus confounding it with grammar. We may, however, with the schools, il-

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lustratively style logic the *grammar of thought*, as general grammar may analogically be termed the *logic of speech*.

In the second place, logic is conversant about *thought considered as thought*. In every act of thinking we distinguish by reflection two things: 1. the object of thought (the matter); 2. the mode of thinking it (the form). For example, when I think "This pen is bad," the matter of the thought is *the bad pen*; the *form* in which the matter is contained is a *judgment*. Again, the word "animal," in so far as it is viewed as expressive of a *certain conceived multitude of living existences*, is material; in so far as it is considered as only significant of a *general notion*, it is formal. This distinction of material and formal in thought was also expressed by the schoolmen in the contrast of *entia realia* and *entia rationis*, of *notiones* (intellecta, conceptus, intentiones) *primæ*, and *notiones secundæ*. This distinction is indeed only a mental abstraction for the sake of science, as the matter and the form of thought are in reality inseparable; for we are conscious of no object excepting under some form of thought, and of no form of thought without a reference to some determinate matter which constitutes the object of thought. Of these, the matter is infinite in variety and number; the form, of few and determinate modifications. Logic, therefore, can only consider the form of thought. For if it took the matter into account, it must either take *all* objects indifferently, or only *some*. On the former principle, logic would be a treatise upon the *omne scibile*, a complement of all the sciences, which is impossible and absurd; and upon the latter, no reason can be shown why certain objects should be selected for consideration, to the exclusion of all others. But if we can neither make all nor some objects of thought the object-matter of logic, it only remains that we propose as its object-matter the form of thought itself; that is, that we consider in logic, thought as thinking, to the neglect of the particulars about which it thinks. Nor is this view of the province of logic any novelty. In the schools, to say nothing of more recent philosophers, logic was universally viewed as a *rational* not a *real*, as a *formal* not a *material* science; in other words, as conversant, not about *things* as conceived or known, but about the *mode* of conceiving and knowing them. Its object-matter was thus by the schoolmen limited to *entia rationis*, in contrast to *entia realia*; to *notiones secundæ*, in contrast to *notiones primæ*; *to things in general, in so far as they stand under second notions, &c.*; expressions which, when rightly understood, manifest that those persons who employed them held views, in regard to the scope and domain of the science, far more accurate than those latterly prevalent, at least in this country.

In the third place, logic is the science of the *laws* of thought. Logic, as we have seen, is solely conversant about the faculty of thought, considered in its formal relation. But the forms of thought can be made the object of consideration from two points of view. We can either contemplate them as objects of mere *experience*, that is, delineate and arrange the special modifications of the thinking principle, as facts of observation and history; or we may regard them as objects of *speculation*, that is, by means of reflection and abstraction seek out and determine what, as necessary in each act of thinking, affords the condition of the possibility of thought in general. The consideration of the human mind, as an object of experience, belongs not to logic, but to psychology. A knowledge, indeed, of the phenomena of mind, as facts of experience, must chronologically precede their consideration as objects of speculation; the philosophy of the human mind, as an empirical science, forms therefore the natural preliminary of logic as a speculative science. Logic in itself, however, constitutes not the less an independent and exclusive system. For where the knowledge of our intellectual nature founded upon observation and induction ends, and where, by an abstraction from all that experience affords of particular and contingent, we ascend by reflection to the universal, and necessary, and *a priori* conditions it involves, there the domain of logic commences, and that of psychology, as a doctrine explanatory of mere facts, terminates. But if logic be conversant about the universal and necessary in thought, it is thereby conversant about the *laws of thought*. For the universal and necessary is only conceived as what is determined by laws; and again, the very conception of a law involves the universality and necessity of its application.

Logic is thus conversant, not about thought considered in itself, but about thought viewed as subject to laws. Those therefore who, without qualification, make the *operations or processes* of the discursive faculty the object of logic, are wrong; for logic considers these only as governed by laws. Nor is this any modern observation. "To treat of thoughts as thoughts," says Simplicius, "is not the function of logic, but of psychology." Those schoolmen who held *entia rationis* or *notiones secundæ* to be the object of logic, did not propose that these should be considered in themselves, but only in their application to *entia realia* or *notiones primæ*, as the instruments and regulators of thought; whilst those again who proposed all or some of the three intellectual operations for this object, did so only in as far as these were *dirigible* or determinable by laws.

Thus the same correct view of the science may be detected under forms of expression which at first sight appear to be the most contradictory; and what we have shown in regard to the schoolmen may be more easily proved in regard to the Leibnitzian and Kantian logicians. But though a right conception of the scope and limits of logic must be allowed to have long and generally prevailed, it must be acknowledged that the speculative notion did not in practice regulate the contents and treatment of the science. From Aristotle downwards (the example and authority of the Stagirite having mainly determined the practice of his successors), the purity of the science has been, and is still, contaminated by foreign infusions; and it is only by slow and painful efforts that one extraneous doctrine after another has been banished from its domain. Thus, though it has always been speculatively allowed that logic is exclusively conversant with the form of thought; yet a consideration of the material modality of propositions and syllogisms (a subject as useless as it is irksome) remained, though often overlooked, an integral portion of the science, until it was proved to be intrusive in the article on logic in the *Edinburgh Review* (vol. lvii. p. 220, *et seq.*), and has accordingly, by subsequent writers on the science, been formally expunged, as paralogical, from their systems. In this country there is, however, no work on logic which displays the science in a pure and perfect form; which evolves its doctrines from fundamental principles, and displays its parts in that necessary connection and dependence, which constitutes the elegance of a scientific system. Whately's *Elements of Logic* is the English book which is best deserving of attention. Though somewhat vague and vacillating in its views of the science, and though its doctrines are neither developed from the primary laws of thought, nor combined together as the essential parts of one necessary whole, yet it displays a talent which shows that the author, with a more comprehensive knowledge of his subject, might have produced a work not easily to be superseded. There are also several minor works recently published on logic in this country, not unworthy of consideration, a detailed estimate of which may be seen in the Review previously referred to.

LOGISTÆ, certain officers at Athens, ten in number, whose business consisted in receiving and passing the accounts of magistrates when they went out of office. The *logistæ* were elected by lot, and had under them ten *euthyni* or auditors of accounts.

LOGOGRAPHY, a method of printing, in which the types, instead of answering only to single letters, are made to correspond to entire words. In the year 1783, there appeared a treatise upon this subject by Henry Johnson, in which the origin as well as the utility of the method are largely discussed. Mr Johnson informs us, that about five years before, that is, in the year 1778, intending to publish a daily list of blanks and prizes in the lottery, numerically arranged, he found that it could not be accomplished in time by the ordinary method of printing. On this account he procured types of two, three, or more figures, as was necessary for this purpose; and thus any entire number might as readily be taken up as if it had been a single type. His next attempt was in forming some large mercantile tables of pounds, shillings, pence, and farthings. For these he procured types expressive of any sum of money ready composed and united; "by which every species of figure-printing could be performed for the tenth part of the cost, printers always charging it double the price of letter-printing." Having thus succeeded to his wish in his two first attempts, he next began to consider if the method could not be applied to words; and in this also the success, he says, was equal. The properties of the logographic art, according to its author, are, 1*st*, that the compositor shall have less charged upon his memory than in the common way; 2*d*, that it is much less liable to error; 3*d*, that the type of each word is as easily laid hold of as that of a single letter; 4*th*, that the decomposition is much more readily performed, even by the merest novices, than the distribution of letters; 5*th*, that no extraordinary expense, nor greater number of types, is required in the logographic than in the common method of printing. But, for fuller details, we must refer to the work above mentioned.

LOGRONO, a town of Spain, in the province of Old Castille. It is situated on the banks of the Ebro, in a fertile territory, in which oil, wine, and some corn is produced. It has three parish churches, nine monasteries, two hospitals, and 7000 inhabitants, and was the seat of a court of inquisition.

LOIRE, the largest river in France, rises in the mountains of the Cevennes, and, after running a course of about 500 miles, falls into the Bay of Biscay.

Loire, a department of the south-east of France, formed out of the whole district of Forez, a part of the Lyonnois, and a few portions added from the neighbouring departments. It extends in north latitude from 45. 10. to 46. 12. and in east longitude from 3. 39. to 4. 46. It contains 2032 square miles, or 496,000 hectares. It is bounded on the north by the departments of Allier and Saone-Loire, on the east by those of the Rhone and of the Isère, on the south by Ardèche and the Upper Loire, and on the west by Puy de Dome and Allier. It comprehends three arrondissements and twenty-eight cantons, which are subdivided into 327 communes, and contain a population of 318,500 persons. The face of the country is generally hilly, and towards the south-east is mountainous, where Mount Pilat attains the height of 3000 feet. With this is connected a chain, of lower elevation, called the Pérouse Range, which, from the vast quantity of basalt, is supposed to be extinguished volcanoes. The greatest plain is the basin of the Loire, which is about fifteen miles in extent. The highest mountains are stony, and many of them incapable of cultivation. The sides of the hills, and even the tops of those of lower elevation, are covered with vineyards; and the basin of the Loire, and the other plains in the valleys, are fertile, and yield abundant crops of corn, and much hemp. The chief river is the Loire, which is navigable from Roane, receives the waters of the Semene, the Bonson, the Furand, the Lignon, the Rahins or Rhine, and the Tessonne, as well as that of many smaller streams that issue from the hills. In the middle of the department, especially in the arrondissement of Montbrison, are a multitude of lakes, which abound in fish, the water of which is let off every two or three years, and the ground is sowed with wheat, and thus alternately the land produces fish and corn. The whole growth of corn does not equal the consumption; but the deficiency is supplied from the neighbouring departments, which take hemp in exchange for it. The chief products of the soil are, wine, fruit, honey and wax, chestnuts, wood for building and fuel, and the flesh of sheep, cows, and goats, with cheese made from the two latter classes of animals. The agriculture is but indifferently conducted. Many of even the valleys grow only rye, and the produce of some scarcely equals the expense of raising it. There are numerous coal-mines worked, which yield annually 300,000 tons of that substance. Mines of lead and of iron are also worked, but scarcely yield more of those metals than is consumed within the department. The quarries of granite, marble, porphyry, and flint, are sources of employment and wealth. The chief manufacturing industry is occupied in making ironmongery and cutlery goods; and, besides these trades, many silk goods, chiefly ribbons, are prepared, and cloth of cotton, of wool, and of hemp, with brandy, paper, glass, and leather. The department elects two deputies to the legislative chamber. The capital is Montbrison.

Loire, *Lower*, a department of France, formed out of a part of Upper Bretagne, extending in north latitude from 46. 44. to 47. 50. and in west longitude from 1. 6. to 2. 39. It is bounded on the north by the departments of Morbihan and Ille-Vilaine, on the east by those of Mayenne and Mayenne-Loire, on the south by Vendée, and on the west by the ocean. It is divided into five arrondissements, forty-five cantons, and 209 communes, and contains 417,120 inhabitants. The extent is 3021 square miles, or 766,000 hectares. Of this land, 268,100 hectares are under the plough, 105,700 are pastures and morasses, 137,800 are not cultivated, 82,780 consist of vineyards, 80,430 are woods and forests, and the remainder are the sites of towns and villages, roads, rivers, and salt marshes. The face of the country is generally level, but interspersed with a few hills of inconsiderable height. The highest of them are covered with a vegetable or clayey soil, resting on a bed of granite or schist. In some districts the overflooding has created extensive turf ground, which is applied to the purposes of fuel. The agriculture is in a backward state, though somewhat improved of late years. In the northern portion of the department, wheat, and in greater proportion rye, buckwheat, and pulse, form the grain crops, but in the south-west, wheat is the principal grain; yet the whole corn grown is scarcely more than three fifths of what the consumption requires. The meadows on the left banks of the Loire pasture many cows, and the butter from the dairies is much esteemed. The cultivation of the vine is an important object of industry, especially in the arrondissements of Savenai, Ancenis, and Nantes. The greater part of the wine is converted into brandy. Apples are the most abundant fruit, and a great quantity of cider is made from them in several districts. There are mines of iron and of coal, but the former are not highly productive, and only yield 1000 tons annually; the latter are said to be equal in quality to the best coals of England. The principal manufacture is that of linen; but of late the cotton trade has been much extended, and in printed cotton a great progress has been made, and a large quantity is fabricated. The chief trade is concentrated in the city of Nantes, the capital. A large portion of culinary salt is collected from the marshes on the sea-shore. The river Loire conveys to the sea the water of most of the other streams. The department elects four members of the legislature.

Loire, *Upper*, a department on the south-east of France, formed out of the ancient district of Belay, a part of Languedoc, of a portion of the Upper Auvergne, and of some communes taken from Gévaudun, Vivarais, and Forez. It extends in north latitude from 44. 48. to 45. 25. and in east longitude from 3. 4. to 4. 18. It is bounded on the north by the departments of Puy de Dome and Loire, on the east and south-east by the Ardèche, on the south by the Lozère, and on the west by Cantal. It contains 1920 square miles or 502,854 hectares, is divided into three arrondissements, twenty-eight cantons, and 272 communes, and contains 272,600 inhabitants, of whom about 5000 are Protestants, and the others adhere to the Catholic church. It is generally a mountainous district, consisting of some branches of the range of the Auvergne, and some of the Cevennes range, the highest points of both of which are within this department. The soil is generally of volcanic origin, consisting in a great measure of lava or pozzolana. It is dry and hard, but in the valleys is not wholly unproductive. The principal rivers are the Loire and the Allier, which receive the waters of the several smaller streams; but neither of them become navigable till they have passed out of this department. There are several small mountain lakes, the most extensive of which is that of Bouchet. Although, from the mountainous nature of the district, it is better calculated for pasture than for the plough, yet, as the sides of the hills are cultivated like gardens, and easily irrigated, sufficient corn is grown for the consumption of the population. The chief source of profit in husbandry is the breeding of black cattle and of horses, and making butter and cheese. Fruit is extensively produced, particularly chestnuts and apricots. The bees yield abundance of honey and wax, both of which form branches of the export trade. There are no mines but those of coal, which yield about 18,000 tons yearly. Manufactures are inconsiderable, consisting chiefly of linen goods, and some lace, both of silk and thread. The other articles are those for domestic use, such as leather, heavy ironmongery, and common earthenware. The department furnishes two deputies to the legislative chamber. The capital is Puy en Belay.

Loire and Cher, a department of France, formed out f the ancient divisions of Blesois and Cologne, in the Or-eannois. It extends in north latitude from 47. 18. to 48. 4. nd in east longitude from 0. 28. to 1. 57. It contains 2647 quare miles, or 671,500 hectares, of which 320,000 are rable land, 70,000 are woods, 20,000 are vineyards, and he rest pastures, meadows, rivers, roads, and the sites of owns and villages. It is bounded on the north by the department of the Eure-Loire, on the north-east by Loiret, n the south-east by the Cher, on the south by the Indre, n the south-west by the Indre-Loire, and on the north-est by the Sarthe. It is divided into three arrondisse-ents, twenty-four cantons, and 309 communes, and con-ins a population of 220,000 persons, amongst whom it said there are scarcely 20,000 who can read and write. he department is a level district, with a few inconsidera-e elevations, which are covered with vines. The south-n part or arrondissement of Romorantin is a miserable strict, filled with heaths and swamps, between which only e spots of cultivable land scattered over it, in which are nall and wretched villages. The northern part contains larger proportion of cultivated soil, but is filled with san- heaths, sometimes mixed with clay or chalk, but often-er with pebbles. There are numerous small streams, all of which empty themselves into the two rivers which give their name to the department. No part of France contains so many small lakes and swamps. The agriculture is badly conducted. In many of the cantons no wheat is grown, and in some the only corn is buckwheat, which, with rye from the vicinity, forms the chief bread of the inhabitants. Along the banks of the rivers there are some meadows, which afford pasture for cows; and some good butter and cheese is produced. A number of horses, of a small but active race, are bred on the heathy lands. The land is divided into small portions, and cultivated for the most part by small and poor proprietors. The wine made in the department is chiefly sent to Orleans or Paris, but a great part of it is converted into brandy. The only product of the mines is iron; but flints for muskets are abundantly found, and the army is chiefly supplied from hence. The only manufacturing industry is the spinning of flax, which is carried on in every family. The department elects two deputies to the legislative chamber. The capital is the city of Blois.

LOIRET, a department of France, formed out of a part of the ancient Orleannois. It extends in north latitude from 47. 35. to 48. 22. and in east longitude from 1. 24. to 2. 59., comprehending 2789 square miles, or 675,191 hectares. It is bounded on the north by the departments of the Seine and Oise and the Seine and Marne, on the east by Yonne, on the south by the Nièvre, the Cher, and the Cher and Loire, and on the west by the Eure and Loire. It is divided into four arrondissements, fourteen cantons, and 111 communes, whose population amounts to 134,500 persons. It is, as a whole, a fruitful plain; but, upon the right side of the Loire, it is well covered with profitable forests. The soil is light and sandy, especially in the arrondissement of Montargis, but highly productive, although it scarcely affords a sufficiency of corn for the consumption of the inhabitants. Wine is the most valuable article of cultivation, and both red and white wine of good quality are made, as well as much vinegar and brandy. It is favourably situated for the conveyance of its productions by internal navigation. Much fruit, as well as wood, is conveyed by water to Paris. There are manufactures of cotton and of linen goods, of hosiery, paper, and leather, and some refineries for sugar. The department elects three deputies to the legislative body. The capital is the city of Orleans.

LOJA, or Loxa, a city of Spain, in Granada, within the province of Andalusia. It is situated about twenty miles from the city of Granada, in a gorge between the stupendous mountains which seem to shut in the plain from the rest of the kingdom. At the bottom of this fissure, the river Xenil runs from the plain, and the streets of the city rise above each other on the declivities of the mountain. It was a place of vast military importance when the Moors were in possession of Granada, as it is the only entrance on the western side of the plain. The surrounding country is thickly covered with olive woods, which yield a great quantity of oil. Some corn is raised, but not sufficient for the population, who are supplied with the remainder by exchanging oil. It contains about 9000 inhabitants.

LOKE, in *Mythology*, the name of one of the deities of the northern nations, answering to the Ahriman of the Persians, whom they represent as at enmity with both gods and men, and the author of all the evils which desolate the universe. Loke is described in the Edda as producing the great serpent which encircles the world (which seems to have been intended as an emblem of corruption or sin); and he also gives birth to Hela or death, the queen of the infernal regions, and to the wolf Fenris, the monster who is destined to encounter the gods and to destroy the world.

LOKEREN, a large market-town of the Netherlands, in the province of East Flanders, and the arrondissement of the Dender. It is situated on the river Durme, on the high road from Ghent to Antwerp. It stands in a district yielding heavy crops of corn, hemp, flax, and clover and linseed, which form its chief objects of commerce. It has also manufacturing establishments for making cotton and linen goods, lace, and other goods. It contains 1800 houses, with 12,800 inhabitants.

LOKMAN THE WISE, an eminent philosopher amongst the orientals. The Arabians say he was the son of Baura, the son or grandson of a sister or aunt of Job. He was an Ethiopian, and for some time a slave. It is related that he was born in the time of David, and that he lived till the age of the prophet Jonah. Some suppose him to have been the same with Æsop the mythologist; and indeed we find in the parables or apologues of Lokman in Arabic many particulars which are seen in Æsop's fables, so that it is not easy to determine whether the Greek or the Arabian are the originals. He is said to have been deformed in his person; but this defect was sufficiently compensated by the perfections of his mind. Some pieces of his are extant; and he was looked upon as so excellent a person, that Mahommed has inserted a chapter in the Koran called after his name, in which he introduces God as saying, "We heretofore bestowed wisdom on Lokman." It is related that he obtained his liberty upon the following occasion. His master having given him a bitter melon to eat, he ate it all. Surprised at his exact obedience, his master asked him, How it was possible for him to eat such a nauseous fruit? He answered, "I have received so many favours from you, that it is no wonder I should once in my life eat a bitter melon from your hand." This generous answer of the slave struck the master to such a degree, that he immediately gave him his liberty. A French translation of the fables of Lokman, and of Bidpai or Pilpay, a Brahminical philosopher, by M. Galland, was published at Paris in 1724.

LOLLARDS, in *Ecclesiastical History*, a religious sect, which arose in Germany about the beginning of the fourteenth century, and was so called, as many writers have thought, from Walter Lollard, who began to dogmatize in 1315, and was afterwards burned at Cologne; though others think that Lollard was no surname, but merely a term of reproach applied to all heretics who concealed the poison of error under the appearance of piety.

The monk of Canterbury derives the origin of the word Lollard amongst us, from *lolium*, a tare; as if the Lollards were the tares sown in Christ's vineyard. Abelly says that the word Lollard signifies praising God, from the German *loben*, to praise, and *herr*, Lord; because the Lollards employed themselves in travelling about from place to place, singing psalms and hymns. Others, again, derive *lollhard*, *lullhard*, or *lollert*, *lullert*, as it was written by the ancient Germans, from the old German word *lullen*, *lollen*, or *lallen*, and the termination *hard*, with which many of the Dutch words end. *Lollen* signifies to sing with a low voice, and therefore Lollard is a singer, or one who frequently sings; and in the vulgar tongue of the Germans it denotes a person who is continually praising God with a song, or singing hymns in his praise. The Alexians or Cellites were called *Lollards*, because they were public singers, who made it their business to inter the bodies of those who died of the plague, and sang a dirge over them in a mournful and indistinct tone as they carried them to the grave. The name was afterwards assumed by persons who dishonoured it; for we find that, amongst those Lollards who made extraordinary pretences to piety and religion, and spent the greater part of their time in meditation, prayer, and such acts of piety, there were many abominable hypocrites, who entertained the most ridiculous opinions, and concealed the most enormous vices under the specious mark of this extraordinary profession.

Many injurious aspersions were propagated by the priests and monks against those who assumed this name; so that, by degrees, any person who covered heresy or crime under the appearance of piety was called a *Lollard*. Thus the name was used not to denote any one particular sect, but was formerly common to all persons and all sects who were supposed to be guilty of impiety towards God or the church, under an external profession of extraordinary piety. However, many societies, consisting both of men and women, under the denomination of *Lollards*, were formed in most parts of Germany and Flanders, and were supported partly by their manual labours, and partly by the charitable donations of pious persons. The magistrates and inhabitants of the towns where these brethren and sisters resided, gave them particular marks of favour and protection, on account of their great usefulness to the sick and needy. They were thus supported against their malignant rivals, and obtained many papal constitutions, by which their institute was confirmed, their persons exempted from the cognizance of the inquisitors, and subjected entirely to the jurisdiction of the bishops; but as these measures were insufficient to secure them from molestation, Charles duke of Burgundy, in the year 1472, obtained a solemn bull from Sixtus IV. ordaining that the Cellites or Lollards should be ranked amongst the religious orders, and delivered from the jurisdiction of the bishops; and in the year 1506 Julius II. granted them still greater privileges. Mosheim informs us that many societies of this kind still subsisted at Cologne, and in the cities of Flanders, though they had evidently departed from their ancient rules.

Lollard and his followers rejected the sacrifice of the mass, extreme unction, and penances for sin; arguing that Christ's sufferings were all-sufficient. He is likewise said to have set aside baptism, as a thing of no effect; and repentance, as not absolutely necessary. In England, the followers of Wickliffe were by way of reproach called Lollards, from the affinity there existed between some of their tenets and those of that sect; though others are of opinion that the English Lollards came from Germany. The Lollards were solemnly condemned by the archbishop of Canterbury and the council of Oxford.

LOMBARD, PETER, well known by the title of *Master of the Sentences*, was born at Novara, in Lombardy; but being bred at Paris, he distinguished himself so much at that university, that he had conferred on him the canonry of Chartres, was for some time tutor to Philip son of Louis le Gros, and lastly obtained the see of Paris. He died in 1064. His work of the *Sentences* is regarded as the source of the scholastic theology of the Latin church. He also wrote Commentaries upon the Psalms, and upon St Paul's Epistles.

LOMBARDS, a northern nation, who settled in Italy in the fourth century, and for some time made a considerable figure.

The name of *Lombards*, or *Longobards*, is by some derived from the word *lack*, or *lache*, signifying in the German tongue *winter*, because the Lombards, whilst in Seandinavia, lived in marshes, or near to the sea; whilst others think that it comes from the two German words *langen harden*, or *helleborden*, that is, from the long halberts they were supposed to use in war. But Paulus Diaconus their historian, and who was himself a Lombard, tells us that they were called *Longobards*, from the length of their beards. A nation called *Lombards* is mentioned by Tacitus, Strabo, and Ptolemy; but these are different from the Lombards who afterwards settled in Italy, and are reckoned the same with the Gepidæ, whom the Italian Lombards almost exterminated. The Lombards who settled in Italy are first mentioned by Prosper Aquitanus, bishop of Rhegium in the year 379. That writer tells us, that about the time referred to, the Lombards, abandoning the distant coasts of the ocean, and their native country Scandinavia, and seeking for new settlements, as they were overstocked with people at home, first attacked and overcame the Vandals in Germany. They were then headed by two chiefs, Iboreus and Aion, who, having died about the year 389, were succeeded by Agilmund, who is commonly reckoned the first king of the Lombards.

Before the time of Odoacer, Lombard history presents nothing very remarkable; in his time, however, they settled on the Danube, in the country of the Rugians, whom Odoacer had almost totally exterminated or carried into captivity. During their stay in this country, they rendered themselves formidable to the neighbouring nations, and carried on successful wars with the Heruli and Gepidæ. In 526 they were allowed by the Emperor Justinian to settle in Pannonia; and here they made war a second time with the Gepidæ. Alboin, the Lombard king, killed the king of the Gepidæ with his own hand, put his army to the route, and cut in pieces such numbers of them, that they ceased from that time to be a nation. Having caused the deceased king's head to be cut off, he made a cup of his skull, called in the language of the Lombards *schala*, which he made use of in all public entertainments. However, having, amongst many other captives of great distinction, taken the last king's daughter, by name Rosamunda, he married her after the death of his former wife Clodisvinta, the daughter of Clothaire king of France.

By this victory Alboin gained such reputation that his friendship was courted by Justinian; and, in consequence of the emperor's application, a body of six thousand Lombards was sent to the assistance of Narses against the Goths. The success of the Romans in this expedition, the invasion of Italy by the Lombards, and their successes in that country, have been noticed under the article ITALY. At last, Alboin having made himself master of Venetia, Liguria, Æmilia, Etruria, and Umbria, was slain by the treachery of his wife, in the year 575, being the fourth of his reign. This princess was the daughter of the king of the Gepidæ, whom Alboin had killed in battle, and made a cup of his skull, as above related. As he was one day feasting at Verona, with his chief favourites and principal officers, in the height of his mirth he sent for the queen, and, filling the detested cup, he commanded her to drink merrily with her father. Rosamund, struck with horror, hurried out of the room; and, highly incensed against her husband for thus barbarously triumphing over the misfortunes of her family, resolved, at all events, to make him pay dear for his inhuman and insulting conduct. She discovered her intention to Helmichild the king's shield-bearer, a youth of great boldness and intrepidity; but he peremptorily refused to imbrue his hands in the blood of his sovereign, or to be in any way accessory to his death; and in this resolution he persisted, until, by a shameful stratagem, forced to comply with the queen's wishes. Knowing that he carried on an intrigue with one of her ladies, Rosamund placed herself one night in that lady's bed, and receiving the youth, indulged him in his amorous desires, as if she had been his own mistress. Then discovering herself to the deceived lover, she told him that he must now either put the king to death, or be put to death by him. Helmichild, well apprised that, after what he had done, his safety depended upon the death of the king, engaged in the treason, which he otherwise abhorred. One day, therefore, whilst Alboin was reposing in his chamber after dinner, Helmichild, with some others whom he had made privy to his design, broke in unexpectedly, and fell upon the king with their daggers. Alboin started up and laid hold of his sword, which he had always by him; but having in vain attempted to draw it, the queen having beforehand fastened it in the scabbard, he defended himself for some time with a footstool. In the end, however, he was overpowered, and despatched with many wounds.

Rosamund had promised to Helmichild, that, as soon as he had despatched the king she would marry him, and, with her person, bestow upon him the kingdom of the Lombards. The first part of her promise she immediately performed; but she was so far from being able to bestow the crown upon him, that both of them were obliged to save themselves by flight. They fled to Longinus the exarch of Ravenna, taking with them all the jewels and treasure of the late king. Longinus received her with the greatest marks of friendship and kindness, and assured her of his protection. But she had not been long in Ravenna, before the exarch, thinking that a favourable opportunity now offered for making himself king of Italy by her means, imparted his design to her, and declared his intention to marry her, provided, by some means or other, she despatched Helmichild. Rosamund, highly pleased with the proposal, resolved to satisfy her ambition by getting rid of the person whom she had only married in order to gratify her revenge. Accordingly, having prepared a strong poison, and mixed it with wine, she gave it to her husband as he came out of the bath, and called for drink, according to his custom. Helmichild had not half emptied the cup, when, by the sudden and strange sensation which he felt in his bowels, he concluded what it was; and, with his sword pointed at the queen's breast, compelled her to drink the rest. The poison had the same effect on both, for they died in a few hours. Longinus, on the death of the queen, laid aside all thoughts of making himself king of Italy, and sent the king's treasure to Constantinople, together with Albisoinda, the daughter of Alboin by Rosamund, whom she had brought along with her.

After the death of Alboin, the Lombards chose Clephis, one of the nobility, as their king. But he was murdered after a short reign of eighteen months; upon which ensued an interregnum of ten years. During this time, they extended their conquests in that country; but at length the Romans, jealous of their progress, resolved to put a stop to their victories, and, if possible, to expel them from the country. For this purpose, they entered into an alliance with the Franks; which so alarmed the Lombards that they re-established the monarchical form of government amongst themselves, and chose Autharis the son of Clephis as their king. This monarch, considering that the power of the dukes, who had governed Lombardy for the space of ten years, was during that time tolerably well established, and that they would not probably be willing to part with the authority which they had so long enjoyed, allowed them to continue in their government, but obliged them to contribute one moiety of their revenues towards the maintenance and support of his royal dignity, suffering them to dispose of the other as they thought proper. He reserved to himself the supreme dominion and authority, and took an oath from the dukes, that in time of war they would readily assist him to the utmost of their power. Though he could remove the dukes at pleasure, yet he deprived none of them of their dukedoms, excepting in cases of treason, nor gave them to others, except when their male issue failed. Having settled matters in this manner, he enacted several very wholesome laws against theft, rapine, murder, adultery, and other vices which prevailed amongst his subjects, and was the first of the Lombard kings who embraced Christianity. Most of his subjects followed the example of their monarch; but as they were all instructed by Arian bishops, they continued long infected with that heresy, which occasioned great disputes between them and the orthodox bishops of the cities subject to their sway.

From the re-establishment of the monarchy under Au tharis, until the reign of Rotharis in 636, the history of the Lombards affords nothing memorable.[*] This period is remarkable for the introduction of written laws amongst the Lombards. Before his time they had been governed only by tradition; but Rotharis, in imitation of the Romans and Goths, undertook the publication of written laws; and to those which he enacted many were added by succeeding princes. Grotius prefers the method which the Lombards followed in making laws, to that which was practised by the Romans themselves. Amongst the latter the emperor was the sole lawgiver; and whatsoever he decreed had the force of a law. But the Lombard kings did not assume that power to themselves, since their laws were enacted in public assemblies convened for the purpose, after they had been maturely examined and approved of by all the lords of the kingdom. From these assemblies were excluded the ecclesiastical order, and the people; so that the legislative power was lodged exclusively in the king and the nobles.

The reign of Rotharis is remarkable, not only for his introducing written laws amongst his subjects, but for the conquests which he made, and the successful wars which he carried on with the exarch of Ravenna, whom he totally defeated in several engagements, at the same time making himself master of some part of his territories. This monarch died in 652; and the affairs of the Lombards went on prosperously, till the ambition of Luitprand laid the foundation of the total ruin of his kingdom. He ascended the throne of Lombardy in 711, and watched every opportunity of enlarging his dominions at the expense of the emperor. For this a fair occasion offered in 716. The Emperor Leo Isauricus, who at that time reigned in the East, having, by his famous edict, forbidden the worship of images, and ordered them to be everywhere pulled down, the people were so incensed at that innovation, that, in several places, they openly revolted, and, falling upon the emperor's officers, drove them out of the cities. In the East, Germanus, the patriarch of Constantinople, opposed the emperor's design with great warmth; but Leo caused him to be deposed, and Anastasius to be raised to that see in his room, at the same time ordering that all the images in the imperial city should be pulled down and publicly burned. He strictly enjoined his officers in the West, especially the exarch of Ravenna, to see his edict punctually obeyed in their respective governments. In compliance with these orders, Scholasticus, then exarch, began to pull down the images in all the churches and public places in Ravenna; a proceeding which incensed the superstitious multitude to such a degree, that, taking arms, they openly declared that they would rather renounce their allegiance to the emperor than give up the worship of images.

A kind of civil war being thus kindled in the city, Luitprand thought he had now a favourable opportunity of making himself master of the seat of the exarch, not doubting but the conquest of such an important place would be followed by that of the whole exarchate. Having therefore drawn together all his forces, he unexpectedly appeared before Ravenna, which he closely besieged. The exarch had little expected such a surprise, a friendly correspondence having been maintained for many years between the exarchs and the Lombard kings. However, he defended the place with such courage and resolution, that Luitprand, despairing of success, raised the siege, and led his army against Classis, at a small distance from Ravenna, which he took, plundered, and levelled with the ground. The loss of this place, and the severe treatment which the inhabitants met with from the king, threw the citizens of Ravenna into the utmost consternation. Informed of this, Luitprand resolved to take advantage of their fears, and, returning before Ravenna whilst the inhabitants were thus disheartened, to attempt once more the reduction of the place. Accordingly he led his whole army against it, and, by frequent attacks, tired the inhabitants and garrison to such a degree, that the exarch, finding they could hold out no longer, and despairing of relief, withdrew privately. Luitprand, informed of his retreat, attacked the town with more violence than ever; and, having carried it by storm, gave it up to be plundered by his soldiers, who found in it an immense booty. The king stripped it of most of its valuable monuments of antiquity, and, amongst the rest, caused an equestrian statue of an emperor, of wonderful workmanship, to be conveyed to Pavia, where it is to be seen to this day. The reduction of Ravenna was followed by the surrender of several cities of the exarchate, which Luitprand reduced to a dukedom, appointing Hildebrand his grandson to govern it with the title of duke, and giving him, as he was yet an infant, Peredeus duke of Vicenza as his guardian.

The conquest of Ravenna and the greater part of the exarchate alarmed Gregory II. bishop of Rome. He was then at variance with the emperor, whose edict against the worship of images he had opposed with all his might, and thereby provoked Leo to such a degree that he had threatened to drive him from the see, and send him into exile. However, the pope, no less jealous of the power of the Lombards than all his predecessors had been, resolved, by some means or other, to put a stop to their conquests. The only prince in Italy to whom he could have recourse, was Ursus duke of Venice. To him accordingly he wrote a very pressing letter, conjuring him to assist his worthy son the exarch, and, for the love of the holy faith, to attempt with him the recovery of the exarchate, which the wicked nation of the Lombards had unjustly taken from his sons Leo and Constantine, emperors. Ursus and the Venetians, moved with the pope's letter, and at the same time alarmed at the growth of so powerful a neighbour, promised to assist the exarch with the whole strength of the republic; and accordingly fitted out a considerable fleet, pretending that it was designed for the service of the emperor against the Saracens. At the same time the exarch, who had taken refuge in Venice, abandoning that place as it were in despair of bringing the duke over to his party, raised, in the places still subject to the emperor, what forces he could; and having got together a considerable body, he marched with them towards Imola, giving out that he designed to besiege that city; but turning on a sudden towards Ravenna, as had been agreed upon between him and the Venetians, he laid siege to that city by land, whilst almost at the same instant they invested it by sea. Peredeus defended the town for some time with great courage and resolution, obliging all those who were able to bear arms to repair to the walls. But the Venetians having, in spite of all opposition, forced open one of the gates on the seaward face, the city was taken, and Peredeus slain, whilst he was attempting, at the head of a chosen body, to drive the enemy from the posts they had seized. As for Hildebrand, he fell into the hands of the Venetians, who, having thus recovered Ravenna to the emperor, returned home, leaving the exarch in possession of the city. Luitprand was then at Pavia; but the town was taken before he could assemble troops to relieve it.

Gregory, bishop of Rome, to whom the recovery of Ravenna was chiefly owing, having persuaded himself that the emperor would, out of gratitude, give ear to his remonstrances and admonitions, began to solicit him more pressingly than ever to revoke his edict against the worship of images; but Leo, apprised that the bishop, in all the measures he had taken, had been more influenced by a regard to his own interest than to that of the empire, instead of listening to his remonstrances, was still more provoked against him for thus obstinately opposing the execution of his edict. Being therefore resolved at all events to cause it to be observed in Rome itself, and, on the other hand, not doubting but the pope would oppose it to the last, in order to remove all obstacles, he sent three officers to Rome, with private orders, either to despatch the pope, or to take him prisoner and convey him to Constantinople. At the same time, he wrote to Mauritius, duke of Rome, secretly enjoining him to assist his officers in their undertaking; but no favourable opportunity having offered to put their design in execution, the emperor, in the year 725, recalled Scholasticus, and sent Paul, a patrician, into Italy, to govern in his stead, with private instructions to encourage the officers already mentioned with the promise of great rewards, and to assure them of his protection.

But, in the mean time, the plot was discovered, and two of the conspirators having been apprehended by the citizens of Rome, were put to death; the third escaped into a monastery, where he took the monastic habit, and ended his days. Hereupon the exarch, in compliance with the emperor's orders, resolved to proceed no longer by secret plots, but by open force. Accordingly he drew together a considerable body of troops, and set out at their head, on his march to Rome, with the design of seizing the pope, and sending him, as he had engaged to do, in chains to Constantinople. But, on this occasion, Luitprand, though highly provoked against Gregory for having stirred up the Venetians against him, resolved to assist him and the citizens of Rome against the exarch, in order to keep the balance even between them, and, by aiding sometimes the one, and sometimes the other, to weaken both. Pursuant to this resolution, he ordered the Lombards of Tuscany, and those of the dukedom of Spoletto, to join the pope and the inhabitants of Rome, who being by this reinforcement far superior in strength and number to the exarch, obliged him to return to Ravenna, and give over all thoughts of any further attempt on the person of the pope.

In the mean time, Leo, persisting in his former resolution of suppressing throughout his dominions the worship of images, sent fresh orders to the exarch Paul, strictly enjoining him to cause his edict to be put in execution in all the cities of Italy, especially in Rome. At the same time, he wrote to the pope, promising him his favour and protection, if he complied with the edict; and declaring him, if he continued to oppose it, a rebel, and no longer invested with the papal dignity. But Gregory was so far from yielding to the emperor's threats or promises, that, on the contrary, he solemnly excommunicated the exarch for attempting to put the imperial edict in execution, and at the same time wrote circular letters to the Venetians, to King Luitprand, to the Lombard dukes, and to all the chief cities of the empire, exhorting them to continue stedfast in the Catholic faith, and to oppose with all their might such a detestable innovation. These letters made such an impression on the minds of the people in Italy, that though of different interests, and often at war with one another, they all united, protesting they would defend the Catholic faith, and the life of the pope, in so glorious a cause, at the expense of their own; nay, the citizens of Rome, and the inhabitants of Pentapolis, now the March of Ancona, not content with such a protestation, openly revolted against the emperor, and pulling down the statues, elected, by their own authority, magistrates to govern them during the interregnum. We are even told, that, transported with a blind zeal, they were for choosing a new emperor, and conducting him to Constantinople, not doubting that the people would everywhere join them. But the pope, thinking this resolution unseasonable and impracticable, opposed it.

In the mean time, the exarch Paul, having gained a considerable party in Ravenna, began, pursuant to the repeated orders from the emperor, to remove the images, as so many idols, out of the churches. Hereupon the adverse party, supported and encouraged by the pope, flew to arms, and, falling upon the *iconoclasts*, or image-breakers, as they styled them, raised a civil war within the walls of Ravenna. Great numbers were killed upon both sides; but those who were for the worship of images prevailed in the end; a dreadful slaughter was made of the opposite party; and, amongst the rest, the exarch himself was murdered. However, the city of Ravenna continued faithful to the emperor; but most of the citizens of Romagna belonging to the exarchate, and all those of Pentapolis or the March of Ancona, abhorring the emperor as an heretic, submitted to Luitprand, king of the Lombards, who, pretending a zeal for the Catholic religion, took care to improve the discontent of the people to his advantage, by representing to them that they could never maintain their religious rights under a prince who was not only an heretic, but a persecutor of the faithful.

In Naples, Exhilaratus, duke of that city, having received peremptory orders from the emperor to cause his edict to be put in execution, did all that lay in his power to persuade the people to receive it; but finding his endeavours thwarted by the bishop of Rome, for whom the Neapolitans had a great veneration, he hired assassins to murder the pontiff. But the plot being discovered, though carried on with great secrecy, the Neapolitans, highly provoked against the duke, tore both him and his son to pieces, and likewise put to death one of his chief officers, who had composed a libel against the pope. Luitprand, and Gregory, at that time Duke of Benevento, laying hold of so favourable an opportunity to make themselves masters of the dukedom of Naples, did all in their power to persuade the Neapolitans to submit to them. But the Neapolitans, bearing an irreconcilable hatred to the Lombards, with whom they had been constantly at variance, rejected every overture of that kind with the utmost indignation; and continuing stedfast in their allegiance to Leo, received from Constantinople one Peter, who was sent to govern them in the room of Exhilaratus. Some writers suppose that the Neapolitans, in this general revolt of the cities of Italy, had shaken off the yoke along with the rest, and appointed magistrates of their own election to govern them, in the room of the officers hitherto sent from Constantinople, or named by the exarch. But they are certainly mistaken; for it is manifest from history that Peter succeeded Exhilaratus in that dukedom, and that the Neapolitans continued to live under the emperors until they were conquered many years afterwards by the Normans.

In the mean time, Leo, hearing of the murder of the exarch, and the general revolt of the cities, and not doubting that the pope was the chief author of so much mischief, sent the eunuch Eutychius into Italy, with the title and authority of exarch, strictly enjoining him to get the pope despatched by some means or other, since his death was absolutely necessary for the tranquillity of Italy. The exarch spared no pains to get the pope into his power. But a messenger, whom he had sent to Rome, being apprehended by the citizens, and an order from the emperor being found upon him to the imperial officers in that city, commanding them to put the pope to death at all events, the pontiff's friends thenceforth guarded him with such care, that the exarch's emissaries could never afterwards find an opportunity of executing their design. As for the messenger, the Romans were for putting him to death; but the pope interposed to save him, and contented himself with excommunicating the exarch.

And now the Romans, provoked more than ever against Leo, and, on the other hand, unwilling to live under the Lombards, resolved to revolt against the emperor, and appoint their own magistrates, keeping themselves united under the pope, not as their prince, but only as their head. This they did accordingly; and from these slender beginnings the sovereignty of the popes in Italy took its rise, though the pontiffs did not then, as is commonly supposed by historians, become sovereign lords of Rome, but many years afterwards.

Eutychius failed in his design upon the life of the pope; but having brought with him from Constantinople a good number of troops, he easily quelled the rebellion in Ravenna, and severely punished the authors of the late disturbances. As for the rebellious Romans, he was well apprized that he could never reduce them, as long as they were supported by the king of the Lombards; and therefore he employed all his art and policy to detach that prince from the party of the Romans, and to bring him over to his own interest.

Luitprand for some time withstood all his offers; but Thrasimund, duke of Spoletto, having revolted at that juncture, the exarch, taking advantage of the opportunity which presented itself, offered to assist the king with all his means against the rebellious duke, provided he would, in like manner, assist him against the pope and the Romans. With this proposal Luitprand readily closed; and a league being concluded upon these terms, between him and the exarch, the two armies joined, and began their march towards Spoletto. At their approach, the duke, despairing of being able to resist two such powers, came out with a small attendance to meet them, and, throwing himself at the king's feet, sued, in that humble posture, for pardon; which Luitprand not only granted him, but confirmed him in the dukedom, after he had obliged him to take a new oath of allegiance, and to give hostages for his fidelity in time to come. From Spoletto, the two armies marched, in pursuance of the treaty, to Rome, and encamped in the meadows of Nero, between the Tiber and the Vatican.

Gregory had caused the city of Rome to be fortified in the best manner he could; but being sensible that the Romans alone could not long hold out against two such armies, and reflecting on the kind treatment the duke of Spoletto had met with upon his submitting to the king, he resolved to follow his example; and accordingly, taking with him some of the clergy, and the principal inhabitants of the city, he went to wait upon the king in his camp, where, by a pathetic speech, he softened Luitprand to such a degree, that throwing himself at his feet, in the presence of the whole army, he begged pardon for entering into an alliance against him, and, assuring him of his protection for the future, he went with them to the church of St Peter, where, disarming himself in the presence of his principal officers, he laid his girdle, his sword, and his gauntlet, with his royal mantle, his crown of gold, and cross of silver, on the apostle's sepulchre. After this, he reconciled the pope with the exarch, who was thereupon received into the city, where he continued for some time, maintaining a friendly correspondence with the pope. At this time an impostor, taking the name of Tiberius, and pretending to be descended from the emperors, seduced a great many people in Tuscany, and was by them proclaimed emperor. The exarch resolved to march against him; but as he had not sufficient forces to oppose the rebels, Gregory, who let slip no opportunity of obliging Leo, persuaded the Romans to attend the exarch in this expedition, by which means the usurper was taken in a castle, his head sent to the emperor, and the rebellion utterly suppressed. But the emperor still insisting upon his edict against the images being received in Rome, the Romans, at the instigation of the pope, publicly renounced their allegiance to Leo, paid him no more tribute, and withdrew for ever their obedience to the emperors of the East.

Leo, informed of this revolt, and not questioning that the pope was the author of it, immediately caused all the patrimony of the church of Rome in Sicily, Calabria, and his other dominions, to be confiscated. At the same time he ordered a powerful army to be raised, with the design of recovering the towns which had revolted, chastising the Romans for their rebellion, and, above all, being revenged on the pope, who had raised these disturbances, by himself opposing, and persuading others to oppose, the execution of his edict. Gregory, alarmed at the warlike preparations which were making throughout the empire, and well apprised that they were chiefly designed against himself and the Romans, resolved to recur to the protection of the French, the only nation at that time capable of coping with the emperor, and upon whom, on account of their zeal for religion, he thought he might depend. The Lombards were then very powerful; but, as they wanted to be masters of Rome, he did not think it advisable to trust them. The Venetians, though zealous in the defence of the pope, were not yet in a condition to withstand the power of the emperor, and, besides, were jealous of the Lombards, who watched all opportunities of enlarging their dominions at the expense of their neighbours. As for Spain, it was then in a deplorable condition, being overrun, and almost wholly ruined, by the Saracens.

The French nation was at this time governed by the celebrated Charles Martel, who had distinguished himself in an eminent degree in the wars of France and Germany; and having, not long before, gained a signal victory over the Saracens in the neighbourhood of Tours, he was generally reputed the best commander, and the greatest hero, of his time. To him, therefore, Gregory sent a solemn embassy, with a great number of relics, earnestly entreating him to take the Romans, and the church, under his protection, and to defend them against the attempts of Leo. The ambassadors were received with extraordinary marks of honour, and a treaty was soon concluded between them and Charles, who engaged to march into Italy in person, at the head of a powerful army, in defence of the Romans and the church, if they should be attacked either by the emperor or the Lombards. On the other hand, the Romans were bound to acknowledge him as their protector, and to confer upon him the honour of the consulship, as it had been formerly conferred on Clovis by the Emperor Anastasius, after that prince had defeated the Visigoths. The ambassadors returned from France loaded with rich presents. But Gregory did not long enjoy the fruit of their negociations; for he died the same year, 731, and was succeeded by Gregory III., in whose time some have placed the embassy here mentioned.

At this time the French nation had just recovered from its distressed situation under the descendants of Clovis; and, by the bravery and conduct of Charles Martel, it had become the most powerful kingdom in the west. His successor Pepin was no less wise and powerful than his father had been; and as the ambition of the Lombard princes would be satisfied with nothing less than the entire conquest of Italy, the French monarch, Charlemagne, under colour of assisting the pope, at last put an end to the empire of Lombardy.

LOMBARDY.

This interesting part of Italy was in remote periods thinly inhabited, till in the sixth century it formed a kingdom. As the history of Lombardy is in this work included in the general history of Italy, we must refer to that article in its alphabetical order, where may be traced the manner and period by which it became the territory of the house of Austria.

In its present state it is distinguished by the name of the kingdom of Venetian Lombardy, which was conferred on it by the treaties of Vienna in 1815. It is a compact territory, bounded on the north by Switzerland and the Tyrol, on the east by Illyria and the Adriatic Sea, on the south by the States of the Church and the duchies of Modena and Parma, and a part of the kingdom of Sardinia, and on the west by Sardinia. It extends over 18,744 square miles, and contains 4,217,650 inhabitants, all of them adhering to the Roman Catholic church.

The far greater part of this kingdom is a level plain, bounded on the north by the Rhætian Alps, and on the south by the river Po, into which most of the numerous rivers and rivulets empty themselves. The whole valley declines towards the south, but so gently, that the fall of water in that river, from its source to its mouth, is not more than 190 feet; and the smaller streams are equally languid. The soil is generally light, but fertile, on a basis of calcareous subsoil, except that at the foot of the mountains there are some portions of sandy heaths, and on the coast, where the great rivers discharge their waters, the land is marshy, and formed into extensive lagunes. In the mountainous northern border the land is frequently stony, but even there the soil which covers the valleys is a vegetable mould of a greater or less degree of fertility.

The mountains which form the southern boundary, and which are within the kingdom, are a portion of the Alps, beginning on the north side of the lake of Como, and extending between it and Switzerland to the Tyrol. The valley of the Valteline is enclosed by them; and the loftiest points are, the Splugen, 8130; the Legnone, on the lake of Como, 8130; the Godena, 7459; the Tremezzo, 5106; and the Corno de Canza, 4260 feet in height. Some of the mountains on the frontier towards the Tyrol are still higher, but have this difference, that they are not at all seasons bound in frost. Towards the east these ranges of mountains are joined with those of Carinthia. Amongst all these extensive elevations are to be found valleys of greater or less extent, but of high fertility, and presenting the most exciting prospects.

The Po, the greatest of the Lombardy rivers, has a course of near 200 miles; and, though languid in its current, is so filled, generally in the spring, as to cause extensive inundations on both its banks. In its progress it receives the waters of the Ticino, which rises near Mount St Gothard, and joins the Po near Pavia. The other streams which contribute to this great river are, the Olona, the Lambro, the Adda, the Oglio, and the Mincio. The next great river is the Adige or Etsch, which rises in the Tyrol, passes through two lakes near to Botzen, where it receives the Eisach, when it becomes navigable and enters Lombardy, and then, passing by Rivoli, empties itself into the Adriatic Sea at Brendola. In its progress it is augmented by the waters of the Brenta, the Bachiglione, the Piave, the Livinza, the Lemone, and the Tagliamento, all of which are navigable.

In Lombardy there are two descriptions of lakes, those of fresh water amongst the mountains, and those of salt water in the level country on the borders of the Adriatic. Of the former, the most remarkable for extent, and for the picturesque scenery on the banks, are the following: 1*st*, Lago Maggiore. It begins in the Swiss canton of Ticino, and extends into the boundaries of Lombardy and of Sardinia to Sesto. It is formed by the river Ticino and twenty-six smaller streams, is about forty-eight miles in length, from four and a half to seven in breadth, varying considerably, and generally from twenty-four to thirty feet deep. It is connected by the river Tresa with the lake of Lugano, and is 750 feet above the level of the sea. 2*d*, Lago Lugano. This is also on the frontiers of Switzerland, is 870 feet above the level of the sea, and is fed by forty-three brooks and rivers, entering it from the Austrian dominions. 3*d*, Lago di Como. This is formed by the river Maixa, near Cordona, and is divided on the southern part into two arms or branches. Its elevation above the sea is about 700 feet; the greatest length is thirty-seven miles, and its breadth varies from one and a quarter to four miles. It is plentifully stocked with fish; the banks are studded with farms and villages, whilst the lofty mountains form a most picturesque background to the scenery. The river Adda receives from it several of its tributary streams. 4*th*, Lago d'Iseo. This lake, near the foot of the mountains, is about twenty miles in length, and in breadth varying from four and a half to seven miles. 5*th*, Lago d'Idro, which is only about seven miles in length. 6*th*, Lago di Garda, or, as it is still sometimes called by the ancient name, Lake of Benaco. It is one of the most beautiful of the lakes of Lombardy, is about thirty-five miles in length, varying in breadth from four to fourteen miles, and in depth from ten to 300 feet. It is chiefly fed by the river Sarca, and a discharge of its water near Peschiera forms the river Mincio. It was the subject of the panegyrics of Virgil and Catullus; and has been rendered celebrated by the victories of Bonaparte over Wurmser in the year 1796.

The lagunes are formed by the rivers which descend from the Alps, and spread along the shores of the Adriatic; they are defended from the sea by steep artificial walls, not unlike the dykes in Holland, which in some degree prevent the influence of the rise and fall of the tides; but in some cases, where the force of the sea has broken through, harbours have been formed. Of such havens, there are four large ones, viz. Malamoco, Santa Nicolo, Chioggio, and Tre-Porti; and two inconsiderable, viz. Lido Maggiore and St Erasmo.

There are mineral springs of various degrees of efficacy and reputation for medicinal purposes. The most remarkable of them are at Worms and Massimo in the Valteline, at Albano in the delegation of Padua, at Caldiero near Verona, at Recoaro in the province of Vicenza, at Trescoria and St Pelegrino in the delegation of Bergamo, and Cenedo and Piano in that of Treviso. The climate is very mild, except on the border mountains. On the plains the snow scarcely ever remains on the ground, and it is rare that ice is found in the still lagunes near Venice. What falls from the heavens in winter is much more common in the form of rain than of hail or snow. The winter scarcely lasts more than two months; and in February the fields are covered with new grass. In May the hot weather begins, and the harvest is secured in June and July. In September and October the annual labours of the vintage are performed.

The climate, on the whole, may be described as healthy; but from that description must be excluded those parts where rice is extensively cultivated, as well as the vicinity of Mantua, and the marshy districts extending from Venice to Rovigia, and beyond it. In the latter, sickness is marked in the complexions of the inhabitants; and numbers of the people from the Apennines, or of Illyrian peasants, a hardy race, who descend from their lofty homes to gather the harvest, fall victims to the marsh fevers.

As Lombardy is the most densely peopled, so it is the best cultivated, district in Europe. In no other part is the benefit of irrigation more clearly understood, or more accurately appreciated; and the practical application of it becomes in some measure a substitute for that animal manure which is more abundantly supplied in the other most productive portions of the earth. Although, from the nature of the climate and the habits of the people, a larger quantity of leguminous vegetables are used for aliment than of bread and flesh, yet abundance of corn is annually raised. Wheat, barley, and oats are grown, but not extensively; and rye is to be found very rarely, excepting in the delegation of Friouli; but, on the other hand, rice is grown to a great extent, insomuch that the government has attempted to check its further extension. As the wealth and prosperity of Lombardy, and in fact of the whole of Italy, is derived chiefly from the productions of the soil, an extended view of its agriculture must be of much importance; and we enter upon the subject here, because, in the description of the agriculture of the other parts of Italy, it will only be necessary, in the progress of this work, to refer generally to the practices of Lombardy, and to point out the few differences that may exist.

The importance of irrigation is more felt, and the practice of it more extended, in Lombardy, than in any other part of Europe. This depends much on the physical circumstances of the country, but has also in a great measure arisen from the skill of the people, who, by long practice in the art of conducting water, have acquired the habit of leading it to the parts where it may be applied with the greatest success.

Two of the reservoirs that supply water for the purpose of irrigation, viz. Lago Maggiore and Lago di Lugano, are only in part within the Austrian territory; but the waters they discharge enter that part of Italy, and become available within it for both the purposes of internal navigation and of irrigation. The lakes of Como and of Garda, and several of smaller extent, are wholly within the boundaries of Lombardy. All of them are vast deposits of water, chiefly formed by the rapid streams issuing from the frozen ice and snow of the Alps, and in part by springs, which abound near the foot of those lofty elevations. They are scarcely ever frozen, and never to so intense a degree as wholly to suspend the course of the streams which issue from them, and so powerfully tend to fertilize the land through which they pass in their progress towards the Po.

The lake of Como and Lago Maggiore are about 700 feet above the level of the sea; and that of Garda, whose termination is nearer the Po, is 150 feet above it. As the Po is a river of many sinuosities, by which its course to the sea is much elongated, the river Ticino, from Lago Maggiore, which joins the Po a little below Pavia, is calculated at that point to be about 300 feet above the level of the Adriatic, and, through the stream of the Po, with many curves, is at length lost in the sea.

The plains of Lombardy, then, may be considered as a gentle slope, looking to the south, and bounded in that quarter by the Po. If the average distance from the foot of the mountains, where the lakes have been formed, to the Po, be computed at sixty miles, and the points where the rivers fall into it at 300 feet lower, we may assume that the slope of the plain is at the rate of about five feet in the mile. Such a rate of declination cannot be accurate, but it is a sufficient approximation to accuracy to give an idea of the facility with which irrigation may be performed. Though this representation of the gradual sloping of the face of the country may be generally applicable to it, yet many exceptions must be allowed for. Between the courses of the various streams are numerous elevations, though none of them lofty, which are too high to be susceptible of being irrigated by the great rivers; but in many instances such spots are benefited by being near to springs or brooks, which the long acquaintance of the natives with the practices of irrigation leads them to apply in a greater or less degree to that purpose. Near to the principal streams which convey these collected waters to the sea, there are portions of land so low as to be liable to such abundant overflowings, that they can only be for a time left with a surface sufficiently dry to admit of cultivation for rice; and the vicinity of such lands is injurious to human life, whilst those fields which can, at the will of the occupier, be left either dry, or watered with streams in motion, are not known to be less salubrious than those on the hills near them.

The facilities for irrigation in the best districts have been much increased by the construction of canals, which, whilst they serve the purpose of inland navigation, are made use of to convey streams of water over the fields, which pass from the property of one proprietor to that of another, till they enter again the canals at a lower level. Some of these canals are the work of remote ages. The most ancient, as well as the most considerable, of these, is the *Naviglio Grande*, which was opened in the year 1270. The water is conveyed to the Ticino, near Tornavento, and proceeds to Abbiategrasso, a distance of eighteen miles, where it divides into two branches. One of these is conducted to Beneguardo, eleven miles, and the other to Milan, fourteen miles, thus making a line of forty-three English miles. This great undertaking was commenced after the death of Charlemagne, just as the cities of Lombardy began to be constituted independent states, about the year 1177, and in a few years was executed to Abbiategrasso. It was extended to Milan by 1257, but was then only adapted to the purpose of irrigation. It was next widened, and thus rendered navigable, at the expense of the city of Milan, which, within that period, had become the capital of a rich dukedom; and, by the water communication it thus obtained, flourished in a great degree from its commerce, as well as from the rich fields which the waters had rendered highly productive.

It would be needless to record the progress of the other canals which have since been constructed, or to enumerate them. It may not, however, be improper to notice the last of these great and beneficial works. It is known as *Nuovo Naviglio di Pavia*, and passes from Milan to Pavia, through Benasco, and there falls into the Adda, a little above the junction of that river with the Po. This undertaking was begun in 1814, and completed in 1819. The quantity of goods conveyed by it, and the quantity of water supplied by it to the neighbouring fields, have secured a large profit to the operators, and conferred a great additional value on the lands in its vicinity.

An ancient law of Lombardy has contributed, from the most remote period, to the extension of the distribution of water. The whole of that substance was the property of the sovereign. An individual, or a corporate body, might purchase the water, and thereby acquire the right to conduct it by canals in any direction, and there to sell it to the cultivators. But they could not carry it through gardens or pleasure-grounds, and were bound to pay the owners of the land the value of that portion which was made use of for the passage of the water. In process of time the right of the sovereign over the water was ceded to those who became the purchasers thereof, and was at length extended to those who had springs on their ground, or should afterwards discover any. One instance recently occurred of the exercise of this right. An individual found a spring on a small piece of ground, seventeen miles from the main bulk of his property, and conducted the water from one to the other over the lands of a vast number of proprietors. Though, as all judicious people foresaw, he ruined himself by the operation, instead of making money by selling his water near the spring, as he might have done, yet the law proceedings which arose confirmed the right.

The value of water in Lombardy is best seen by a comparison of the rent paid for land of the same quality, according to the power of obtaining irrigation. Dry meadows will let at from 24s. to 40s. per English acre, and that so situated as to be accessible to water is eagerly rented at from 48s. to 160s. per acre, according to its greater or less capability of obtaining water.

The purchase and sale of water is a traffic of much importance in Lombardy. There are individuals whose sole but respectable incomes are derived from such operations. They are possessors of a given volume of water which they have purchased out of the great canals, or they have several small springs or brooks which they have bought or inherited, united in one small canal, and conducted to such distances as the fall will allow, where it is sold to the cultivators. The greater part of the proprietors are also the owners, or have shares in the canals, from which they procure their water; but many amongst them, and especially those who extend their irrigations, are insufficiently supplied from their own canals, and must consequently buy it from others.

The distribution of water is settled for a term, with strict covenants between the parties. Fixed days and hours are appointed for opening and shutting the sluices, and watchful guards are appointed; but, in spite of all precautions, the courts of law are supplied with most abundant processes from the several parties. The volume of water is reckoned by means of a local measure called the *oneia*, being about two English inches. An opening is made through the sluice, which is three of these oneias in breadth and four of them in depth, and the water is raised two oneias above the top of the orifice through which the passage is made, in order to give due force to the current. This opening is calculated to discharge about seven cubic feet of water in a minute. With this, in twenty-four hours, seven acres of sandy meadow, or six acres of ploughed land, is deemed to be sufficiently irrigated. For the winter meadows, which will be hereafter noticed, a large portion of water is requisite, and the measure here described is applied to not more than one and a third acre. A mechanical contrivance, invented by Ferrari, an officer of engineers, has of late years been chiefly applied to the measuring of water, which has been found to be accurate in its operation; but it is difficult to describe without the drawing, which is given by the inventor in his work, *Descrizioni del modo con cui sono formate le bocche che estraggono l'acque delli naviglj di Milano.*

The value of water depends upon a variety of circumstances, and the purchaser can afford to pay more for that which is applied to gardens and to meadows than for what s wanted on arable land. The water of the canals is of nore value than that which comes immediately from springs or from small brooks. That water which has passed over the land is worth more than that immediatey from the canals, as it is supposed to bring with it more nutritive particles. In the vicinity of Milan the water of he Vettabbia is more valued than any other, because it ontains particles of matter collected from the filth of the ity. In that neighbourhood, the common water obtained from the other canals is generally, where a constant stream s bought, paid for at the rate of from L.40 to L.50 the neia. If it be bought for the winter only, the payment is not more than the same number of shillings. Some instances are stated by a writer of accuracy and veracity, where an oneia of water has been sold for more than L.600. (Breislak, *Descrizione Geologica della Provincia di Milano.*)

Whatever may have been the original component parts of the soil of Lombardy, yet, from the great facilities for irrigation, those lands which are susceptible of that operation have become the most productive of any in the kingdom, or perhaps of any in Europe. There are, however, some exceptions; they are indeed but few, and chiefly confined to the vicinity of Mantua, where, even with great power of watering, the land, which is mere sand, does not produce copiously.

These watered lands may be divided into three classes: The first of them, "convertible meadows," or, in Italian, *Prati a Vicenda*, are the most abundant, and are constantly increasing. They are prepared to be laid down in grass by previous corn or green crops, and those are prepared which require good manuring, and also best tend to clean the land from weeds. The course adopted, therefore, is to grow maize and then wheat, or to sow hemp, succeeded by millet, and that followed by wheat; or, in the first year to sow hemp and then millet, in the second year maize, and in the third wheat. In each of these rotations a half fallow is introduced, and the ground three or four times ploughed, and such fallowing is either in the spring or the autumn, as may best suit the variations in the rotation. Red clover is generally sown in the wheat, which yields a good crop the first year after the wheat harvest, which usually takes place in June, and in the following spring; but after that it disappears, and gives place to most abundant crops of white clover, which seems to be the most natural, and almost the spontaneous, product of the soil, and the seed of which must be scattered on the land by the wind from the fields around it. It continues in grass for three, or in some cases four years, during which time it is mowed three, four, and even five times in the course of the summer. During the process of fallowing, great pains are taken to remove any such inequalities of the surface as would impede the equal distribution of the water over the whole of the field. The soil is removed, by a machine contrived for that purpose, from any part above the level of the field, and thrown into the hollows. The field is divided into narrow beds, between each of which is a water-furrow. In the process of watering, these become first filled, and then from them the water is let in till it rises sufficiently high to cover the whole surface of the land. The same furrows, in excessive rainy weather, serve to drain the land of its surplus moisture. The mode of ploughing naturally raises the middle of the bed somewhat higher than the sides of it, but the difference seldom exceeds four or five inches. The application of fields of this description may be generally stated to be as follows: Three sixths grass, one sixth wheat, one sixth maize, and the remainder flax, beet, rape, or other green crops. There are, as must be obvious to any one acquainted with agriculture, many variations; but, assuming the crops to be grown in that proportion, we cannot be far from accuracy. The portion of the grass-land on these meadows is very great; in many instances where there have been but three mowings and subsequent feedings, they have yielded six London loads of hay to the acre on the average of years, and in some of the best farms near Lodi a load more. There may be mentioned amongst the convertible meadows, those which are chiefly cultivated with rice, which are on the lowest level, and where the watering is the rule, and the letting them dry the exception. The water on them is stagnant during the greater part of the growth of the crops; but, to change the rotation, it is in some years cultivated along with other plants. Such lands may be generally stated to yield, one half of them rice, and the other half an equal portion of clover, wheat, and maize. The culture of rice will be further investigated.

The second of the classes of watered lands are those denominated "permanent summer meadows." These are day by day diminishing in extent, as the cultivators become convinced that it is more profitable to change the plants for a few years, than to leave them constantly in grass. The difference in produce between these and convertible meadows arises chiefly from the gradual disappearance of the clovers, and their place being occupied by a variety of the common grasses. They are fitted more for having their plants converted into hay than those of the convertible meadows, and less adapted for the growth of those kinds of grass which are, in conformity with the general practice of the country, most beneficial for stall-feeding. After the last mowing, they are depastured by the oxen. Most of these meadows have on their banks willows, which are from time to time cut a few inches from the ground, and sold to the basket-makers with great benefit.

The most important portion of the land in Lombardy is that part designated as "permanent winter meadows." In laying them down, great attention is paid to levelling the surface, so that no inequalities may prevent the regular distribution of the water in passing over them, and that in no part there may be hollow places in which it can become stagnant. They can only be created in situations where a flowing stream can in all seasons at pleasure be turned over them. They are usually laid down by sowing them with *lolium perenne* or rye-grass, with about one part of red clover; and the sweepings of the hay loft are abundantly scattered. As these meadows grow older, other grasses appear; and in the later mowing of each year, a large portion of white clover is always found. These meadows are well dunged every year, and the omission of it, even once, is considered by good cultivators as an unpardonable fault. Thus, if the other descriptions of land are not manured, it is because all of them are sacrificed to the winter meadows. Everywhere are to be seen on them heaps of manure, which are to be prepared during the summer, in order to be carried out and equally spread over the surface in the autumn. Those who intend to mow their meadows in the middle of December, carry the manure on them in the latter end of September, and then begin watering them; but those who design to mow them in January, carry on the manure at the end of October, or till the middle of November. If sufficient manure be not obtained from the farm, either ground rape-cake or ashes are used abundantly for the purpose, and thickly scattered over the soil.

The manure is separated as much as possible before the watering commences. At first the water is turned over the meadows in very small quantity, that it may produce the solution of the manure, and thus sink it down to the roots of the plants before the force of the stream can carry it away. Afterwards the water is let on in greater quantities, and especially when the temperature of the air is below the freezing point. At such times the greatest attention is given to create such a current of water as shall prevent it from freezing. If the cold is sufficiently strong to form a thin coat of ice, which rarely happens, the water is instantly withheld, and thus the soil remains free from frost, whilst a thin sheet of ice covers it; and if the cold, as usual, is but for a few days, an additional stream of warmer water melts the ice or carries it away, and the grass remains uninjured, and continues to grow. If, however, the frost should be so strong as to freeze the ground, the first mowing of the meadow would be lost; but such occurrences are so very rare, that they are looked at without any apprehension, nor are any precautions adopted by the cultivators.

As the chief profit as well as the receipt of ready money to the cultivator depends upon the cheese he makes, it becomes of great importance to him to have an abundant supply of green food to produce the milk; and this, which the farmer is afforded in the north of Europe by the use of turnips, mangel wurzel, or meal in tepid water, is supplied in Lombardy, during ten or eleven months, by his winter meadows. It is hence not a subject of surprise that every other portion of his land is sacrificed by the Lombard farmer to the necessity of raising the product of his winter permanent meadows to the highest possible state of productivenesss.

As the lands here spoken of are continually in a state of producing crops, they would in time become exhausted in spite of the irrigation, if they were suffered to remain without the application of abundant manure. Although some considerable quantity of extraneous manure is to be procured from the large cities, by those cultivators who carry on their operations near to them, or to the canals connected with them, yet the larger portion is provided for by the live stock which is maintained on the land. The chief labour of ploughing, except in a part of Pavia, is performed by oxen, and horses are used for the carts and waggons only. The cows are kept in the best possible condition, in order to enable them to yield milk in the greatest quantity, and of the richest quality. The number of black cattle is considerable, as will appear from the following official account of what existed in 1823, since which they have much increased.

Provinces.	Oxen.	Cows.	Bulls.	Young Cattle.	Total.	Sheep.
Milan	16,753	40,089	517	4,929	62,288	4,669
Bergamo	14,216	49,301	590	12,237	76,344	80,579
Brescia	33,374	15,827	278	7,795	57,284	23,365
Pavia	6,069	21,698	584	4,213	32,564	489
Como	17,683	52,311	282	15,771	86,047	54,070
Mantua	30,624	10,885	223	12,116	53,848	12,735
Lodi	10,142	26,189	790	6,405	43,526	2,803
Sondrio	1,835	46,499	470	9,201	58,005	45,600
Cremona	15,880	8,979	171	12,884	37,914	2,169
Total	146,576	271,788	3,905	85,551	507,811	226,479

As the number of young cattle is scarcely in due proportion to the cows and oxen, it may not be amiss to mention in this place, that the Italians used at one period to prefer the young cattle from Switzerland, and drew from thence a considerable number annually; but of late years their own race has been greatly improved, chiefly by the exertions of one enlightened gentleman, Signor Dominico Berra, a follower of the system of our countryman Bakewell, and the annual import of cattle has been diminishing for the last twenty years. The numbers thus brought in of all kinds from 1815 to 1819, were more than 50,000 on the average of the five years. In the next five years, from 1819 to 1824, the average number was 38,800. No official accounts of the subsequent years could be obtained, but there is reason to believe that the diminution had been progressive, and that at this time the number scarcely amounts to 20,000 yearly. In the whole period, however, the stock on the land has gone on gradually increasing.

The whole of these animals are constantly fed in their stalls, or, if sent out to graze, it is but for a very short period. The use of roots, such as turnips, ruta baga, and mangel wurzel, is almost unnecessary, as the cattle can be supplied with sufficient green food from the meadows the whole of the year. The farms where the convertible husbandry is followed have abundance of litter from the straw of the wheat, but especially from the leaves of the Indian corn, which, though good food whilst they are green, are, when they become dry, used in the cattle-stalls for their bedding. Whilst this practice of stall-feeding has been found by long experience the most favourable to the health of the cattle, it is decidedly preferable on account of the vastly greater quantity of manure which it produces. On all the meadow farms a great number of pigs are fattened on whey mixed with the flour of Indian corn. These are put into the styes when they have attained the weight of 100 or 110 pounds, and are kept there during five or six months, till they attain the weight of 350 or 360 pounds. It is found that twenty such pigs yield ample manure for four or four and a half acres of the meadow-land. This kind of manure is highly esteemed for that purpose, but more especially so when proper reservoirs are constructed, out of the influence of the sun or the rain, for the preservation of the urine of the animals. In Lombardy are many small occupiers of land, who have not a number of cows sufficient to yield as much milk as will make a cheese daily. These sell their milk to the cheese-makers near them. In their agreement for the milk for the year, the purchaser contracts to keep in the seller's styes a number of fattening pigs, determined upon by a calculation of the quantity of milk which the cows will yield. It is commonly believed that the number of swine annually fattened by the meadow occupiers amounts to more than 140,000; and, from the great application of the flesh to hams, bacon, and especially to sausages, it does not appear to be an exaggerated estimate.

In a country where the land is chiefly ploughed with oxen, and where, as in Lombardy, much work is performed with the spade and the hoe, the number of other beasts for draft will be proportionally inconsiderable. This is the case here, as the following official account shows, as far as relates to the government of Milan.

Account of the number of Draft Cattle in 1823.

Provinces.	Horses.	Mules.	Asses.
Milan	11,556	1,974	2,789
Bergamo	6,349	2,881	3,033
Brescia	4,897	2,172	1,952
Pavia	5,048	351	249
Como	1,432	1,993	2,253
Mantua	4,025	1,118	2,213
Lodi	8,330	482	600
Sondrio	1,108	616	499
Cremona	1,993	825	456
Total	44,738	12,412	14,044

So scanty a stock of this description of animals can yield but little manure, how carefully soever it may be preserved; nor, with the addition made to it by the 226,479 sheep that are kept, will it bear any comparison with that arising from the half million of black cattle.

It deserves notice with reference to this subject, that the rural parts of Lombardy exhibit but few houses except those of the mere peasantry. The proprietors of even the smaller properties, though they may in some measure be viewed in the light of cultivators, yet, placing their estates in other hands, on the system of the *meta*, seldom find it necessary to reside on or near them, and are satisfied with visiting them at the seasons when the produce is to be divided. When the estates are of small or of moderate extent, or when they are large and comprehend several farms, the superintendence is intrusted to their agents. Such agents, also, in some cases, have the disposal of the share of produce, and account for the proceeds to the proprietors of the soil.

The great body of the population who are in circumstances of even moderate ease are thus collected in the cities and large towns; and in them is thus also collected that mass of corrupted vegetable and animal substances which is most adapted to the purposes of manure, and which is carefully preserved for that application. The cities and towns thus contain a larger proportion of the whole inhabitants than most of the other parts of Europe. If the numerical portion is not greater, the portion who by their mode of living produce the greatest quantities of exuviæ, which are convertible into manure, is much larger. Such of these substances as are of the liquid kind, or are the most easily reduced to that form by putrefaction, are carried into the canals and rivers on which the cities and towns are built; and, when their water is distributed over the first fields with a gentle motion, to enrich them by the deposition of the matter they contain in suspension, no other manure is required to be applied. Whilst the lower grounds near the cities are refreshed by these means, the higher grounds are supplied, with little expense of labour in the conveyance, from the substances which retain a solid or less soluble form.

The management of manure when collected is not so universally attended to as it ought to be; but the best cultivators have adopted a plan that is found highly beneficial, and is likely to be extended. Large sheds are built, sufficient to cover the dung-hills. A bedding of mould is formed about one foot in thickness, on which the dung is heaped to the height of five or six feet. The roof protects the heap from the great quantity of rain which falls in the winter months, and in an equal degree from the excessive drying influence of the sun during the burning months of summer. The fermentation process is regulated from time to time, as occasions require, by the application of the liquid matter from the cattle, which is collected in the cess-pools near the stables and cattle-stalls. Berra asserts that the most profitable money expended on a farm, is that which is applied to building sheds for the reception of dung heaps. Whenever there is an opportunity of doing so, the ashes collected from the bleachers of linen, and those from the soap-boilers, are abundantly used as manure, and are found peculiarly beneficial for the grass land. It is necessary however to use them in very dry weather, when they can be most equably scattered upon the surface. When the air is damp they run together into lumps, which it is difficult afterwards to break.

With the best farmers it is the custom every year to clean out the small canals of irrigation that are formed in every part of the meadow-lands. These ditches contain a compost of various earths, with a large quantity of vegetable and animal matter produced by the decomposition of many organic substances. It is obvious that each of these canals becomes a reservoir, in which is deposited the fat which the water has brought, and which being mixed with the earth in them, must have a great degree of activity in promoting vegetation by the portion of gas it generates, which forms the food of the several kinds of plants.

In some lands of an inferior quality, the practice of growing green crops, and ploughing them in to form manure, has been introduced. A kind of bean called fisole, a species of lupin, grows almost spontaneously on some of even the poor soils. When they are cultivated they produce a large quantity of succulent vegetable matter, which, when covered with earth, and mingled with it, forms an excellent pabulum for other plants. By two operations of this kind in succession, some of the poorest soils on the hills of moderate height have been sufficiently enriched to bear profitable crops of wheat. There is a part of Lombardy, not inconsiderable, where very little or no manure is applied to the land, and yet it is cultivated with corn, though the crops grown are very scanty. It is a portion of the delegation of Mantua, and not far from that city. It is easily susceptible of irrigation, but the soil is one of the poorest descriptions of sand. It is chiefly cultivated by small occupiers. These tenants have no cattle of any kind, and the whole labour is performed by the sole use of the spade and the hoe. Their dwellings and their clothing are of the most wretched description; their food of the coarsest kind, and of that they have at times a bare sufficiency. Their usual course of cropping is alternately with Indian corn and wheat. The farms are from four to eight acres in extent, and are divided into two equal parts, growing the two kinds of corn. One half of the produce is delivered to the proprietor, out of which he pays the taxes, and the other is for the subsistence of the occupier. In some cases the owner takes that half which consists of wheat, and the tenant is supported on the Indian corn. The value of these is nearly equal, as the price of wheat is commonly about one third higher than that of maize, whilst the quantity of the latter exceeds that of the former in about the same proportion. The maize is the sole food of the farmer, and is more convenient to him, as it can be converted into aliment without any other operation previous to its culinary application. It is by those who use it deemed the most healthy food for the working classes. Although the soil is poor, and little or no manure is applied, yet crops are raised, one half of which maintains the labourers who are occupied on the soil, though in the most wretched manner. As the maize is nearly three months in the earth, and the wheat scarcely more than six months, there is an interval between the crops, during which the soil, by being frequently turned over by the spade, imbibes a certain portion of oxygen, which, with the addition of water by the irrigation, furnishes food for the plants.

A district adjoining to this, with a soil somewhat less sterile, but capable of constant irrigation, is chiefly cultivated with rice, growing almost continually, or with very short intervals, in the water. The inhabitants are scarcely maintained on better or more abundant provisions; and, on account of the maladies produced by the stagnant water, are remarkable for their sickly appearance, and for the short duration of their lives.

Lombardy comprehends a large portion of the Alps within its limits. The elevated pasture-lands on these mountains are stocked with cattle only during the summer months. At that time the peasants take up their temporary residence in the chalets, and there convert the milk of the cattle into butter and cheese, as is practised in the adjoining Swiss cantons. The dung of the cattle serves to refresh the pastures during the summer, but no extraneous manure is ever applied to them.

Some mineral manures are used, the most important of which is gypsum, which is ground in mills, and then scattered on the clovers and the grass. Lime is used as a manure in some of the provinces. It is laid on the ground in heaps in October, and covered with the soil; and after the sowing of wheat, the compost with the lime, completely slaked, is spread over the field. The quantity of lime is very small.

In taking a view of the amount of the produce of land in Lombardy, it may be best to begin with the estimate of the marciti, or winter-watered meadows. These are commonly mowed four, five, and even six times in the year; but it is not very easy to determine the quantity of hay they yield, because the chief portion of their produce is consumed by the cattle in the stalls, in the form of grass. One of the most accurate of the practical cultivators (Berra, already mentioned) has constructed a weighing bridge at his farm, over which every load of grass brought from his meadows, as well as the manure carried on them, is weighed and registered. According to him, the average produce, for a series of years, has been as follows. They are kept by him in the weights and measures of the country, but are here reduced into English hundredweights, and English statute acres.

			lbs.
1st	mowing in	January	11,160
2d	ditto	March	16,512
3d	ditto	May	17,220
4th	ditto	July	9,664
5th	ditto	September	8,244
			62,800

That is, $560\frac{3}{4}$ cwts., or 30 loads.

The whole of the grass which is cut in January and in September is eaten in the green state, and the hay is made almost exclusively from what is cut in May and July. In what is converted into hay, it is found that there is a loss of weight by drying equal to three fourths. It is supposed that, from its containing so much more water, the grass cut in January and September would lose five sixths of its weight, and that cut in March four fifths. This view would give six loads of the finest hay as the annual produce of an English acre. There is good reason to believe that this may be near an accurate estimate, because the best meadows frequently, in the two mowings of May and July, yield more than at the rate of five loads per acre; but these are in the vicinity of the city of Milan, where the water that irrigates them is more fully impregnated with the rich drains from the city than that at a greater distance from it. From the last mowing in the beginning of September, till the end of November, the cows are fed on the meadows. Thus to the estimated crops of hay must be added the value of this pasture for the cattle during about two months. The usual price for the best hay in the cities is about 40s. sterling the load. The cost of making it, where the weather is so settled as it usually is in Lombardy, must be trifling, and that with the mowing and carrying cannot exceed the value of the after-feeding, so that each acre will give a profit of L.12 sterling annually. It is not then surprising that such land can be sold as high as 1000 lire the portica, or L.200 sterling the English acre, an occurrence by no means unusual.

The profit of these meadows does not arise from the sale of hay, which, in a country where few horses are kept for pleasure, must necessarily be very insignificant, but from the fattening of cattle in a small degree, and the operations of the dairy as the most important pursuit. The dairies are extensive, and carried on with the greatest care, and most scrupulous attention to cleanliness. The dairy-farms in the three provinces of Milan, Lodi, and Pavia, are mostly occupied by persons of competent capital; many by the proprietors, and the rest by tenants who are not metayers, but have leases for a term never exceeding nine years, at a fixed money rent. They, unlike the farmers in other parts, are the owners of the live stock, and of the implements of husbandry, and have comfortable dwellings, moderately furnished, and are well informed and active, and with diligence unite much economy.

The dairies of the three delegations of Milan, Lodi, and Pavia occupy the second place in the lists of articles as regards the amount, that become the exportable productions of the Milan division of Lombardy. The cheese distinguished by the name of Parmesan is to be found in most parts of Europe, and has long enjoyed a great reputation. It may perhaps have been originally, or at some early period, made in the duchy from which it derives its name. It is not now known in Italy by that name, but bears that of the delegation where the most of it is produced. It is commonly called *Fromaggio Lodisana.* At the present day little or none of it is made in Parma. The annual export of this cheese to foreign countries amounted to 1,800,000 pounds in the year 1824, and in each succeeding year has gone on increasing, besides what is consumed in the Italian and German provinces of the Austrian empire.

The operative part of making the cheese is confined to experienced practical men, who acquire a tact that enables them to time the several steps of the process with great accuracy, and, without the aid of a thermometer, to ascertain the requisite heat of the materials in each of these steps. From the nature of the climate, the milk will not keep long, but a cheese must be made every day. The cheeses are most valuable when they are large; and as the greater number of farmers have not milk sufficient to make such a cheese daily, the milk is sent by them to other farmers, so as to make up the requisite quantity. Thus, on one farm near Lodi (Tavazzano), where only twenty-seven cows are kept, the milk is sent very early to a neighbouring farm, where sixty-three cows are kept. Sometimes four, or five, or more, small farms contribute their day's milk to one who has more stock, to make the cheese; and there are instances where the cazarro or cheese-maker buys the whole of the milk from which his cheese is made.

The cows are milked evenings and mornings, in the first case about five or six o'clock, in the second at daybreak, or just before. The milk of the evening is skimmed of what cream has risen on it before eight o'clock, and the milk of the morning, of that small quantity which is thrown up between day-break and that hour, and from that cream butter is made. Though the Parmesan cheese is thus made from skimmed milk, yet a very large portion of the cream is still left in it to enrich the cheese. The milk is then placed in a kettle, and warmed to the heat of 22° Fahrenheit, when the rennet is applied, the effect of which is increased by a small addition of vinegar, and sometimes of grated cheese, and a very small quantity of pepper. The other parts of the process so much resemble the practices in the best dairy-farms in England, as not to require any special notice.

It is salted after it is made, by sprinkling the surface with that substance daily during six weeks, and turning the cheese to imbibe the particles. These cheeses vary in weight when fit for sale, from fifty-two to 122 pounds avoirdupois. They are kept some time before they are sold, a few at eight months, some at one or two years old, a less number at three, and a few at four years old. It requires much care to preserve the cheese against the heat of the climate. At Codogno and Corsica, where the wholesale trade is carried on, there are large magazines on the ground-floor, twenty feet in height, with shelves around, on which each cheese is placed singly. They have large windows, which are carefully shut to exclude the sun the whole day, but are opened during the night. It is difficult to estimate correctly the average quantity of butter and cheese produced from a given number of cows. In one farm (Meleg-nanello) in the province of Lodi, there were on the farm ninety-one cows, from which were made 173 cheeses, varying in weight from fifty to 120 pounds, but the weight of which the man who made them averaged at 100 pounds each. These had been made in the preceding six months and a half. Supposing the remainder of the year to be equally productive, the whole herd would have yielded on an average at the rate of 370 pounds in the year. There was, however, no certain accounts of the quantity of butter made on the farm during the period; and the quantity of cheese alone, though correct, does not give any certain data upon which to frame an estimate of the productiveness of the animals. The proportion which the cheese bears to the butter varies in the different irrigated provinces. Thus, according to the estimate of the accurate Signor Berra,

lbs. lbs.
100 pounds of milk yields in Lodi $2\frac{38}{100}$ of butter, $6\frac{37}{100}$ of cheese.
100 pounds of milk yields in Milan $2\frac{16}{100}$ of butter, $6\frac{13}{100}$ of cheese.
100 pounds of milk yields in Pavia $1\frac{94}{100}$ of butter, $5\frac{88}{100}$ of cheese.

A writer in a periodical work, *Annali di Agricoltura*, gives the medium product of each cow to be 416 pounds of cheese and 178 pounds of butter yearly. Another person, a practical and accurate man, who had passed much time in examining every portion of the agriculture of the Austrian Italian dominions, gave, as the result of his investigation, a calculation framed from data collected from a considerable number of farms of various extent. According to him, the annual produce from each cow is from 102 to 120 pounds of butter, and from 340 to 392 pounds of cheese. As the informant was perfectly master of the local weights and measures, which vary in each of the provinces of Austrian Italy, some credit may be given to the estimate; and the more so, because it makes the produce of the dairies the lowest, though it far exceeds any returns of the produce of those of Holland, England, or Germany.

The farms in these provinces are generally small. One of 250 English acres would be denominated large; and though there are a few that exceed that extent, yet the greater portion of the irrigable land is occupied by farms much below one half of that extent. Amongst the occupations that are confined exclusively to the *marciti* or winter-watered meadows, many, perhaps the greater part, do not exceed forty acres. As the farms are small, so there are very few proprietors. The family of Luoghi Pii have the greatest tract of the best land in the province of Milan, divided into many farms, and said to amount to 3000 acres. No other exceeds one third of that extent.

The value and the rent of land depend less upon the natural fertility than upon the local situation, on the power of irrigation it can command, and on the capital expended on making roads to it, fences around it, and in erecting houses and agricultural buildings. In the vicinity of the city of Milan, those winter-watered meadows have the greatest value which are to the south, and are watered from the canal of Vettabbia, whose water is furnished by the Riviere Seveso and canal of Martisana, which flow through the city, and bring with them the precious manure of that populous place. The present price of such land is about L.130 sterling the English acre; and, if it has good roads and buildings, may be let to good tenants at from L.6 to L.7 per acre. The land which has not sufficient irrigating power to form winter meadows, but enough for the purposes of convertible husbandry, is worth from L.50 to L.60 per English acre, and may be let at from 60s. to 70s. per acre. In these cases the taxes and repairs are paid by the proprietor, as well as the contributions collected for keeping in proper repair the canal by which water is conveyed. Some parts of the irrigable provinces have lands of inferior natural quality, but being on the banks of the Po, are well calculated to grow rice, by their capability of being constantly flooded. An estate of that description in the province of Pavia, with four acres of winter meadow-land, five acres of land in convertible husbandry, with sufficient for the purpose of occasional irrigation, fifty acres of rice land, and a house, garden, and homestead of two acres, was lately sold at L.2000 sterling, or nearly L.33 per acre. It was doubtful if the purchaser would occupy it or let it, but it was thought a rent might be obtained of somewhat more than L.100 per annum, the owner, as in other cases, paying the government territorial tax.

The value of land is much affected by the rate of the territorial taxation. This is founded on a very old valuation, and the parts that were then in a very high state of cultivation and irrigation must contribute in proportion to that state, whilst the properties that have since been reclaimed, either by irrigation, manuring, or by planting mulberry-trees, or vines, or other valuable trees, pay a less rate, and are consequently of greater value. In the provinces of Milan, Lodi, and Pavia, where the great steps in irrigation were made before the valuation which is now acted upon was framed, the territorial and commune imposts amount to nearly twelve shillings per annum for an English acre, on an average of the whole land, and consequently they are much higher on that of the greatest value. This circumstance alone makes it difficult for a stranger to generalize with any accuracy the value of land, or the rent of it in due proportion to the amount of the sum invested on it. An opinion generally prevails, that the capital laid out in land might be assumed to pay an annual rate of interest of about four per cent., but that as most of the rent, with the exception of the irrigated provinces, was paid in produce, those who employed factors to manage their property, or who managed it themselves, without great judgment and perpetual watchfulness could scarcely calculate on obtaining more than, if so much as, three per cent.

It may serve to give some idea of the difficulty of ascertaining the amount of the rent of land, if a slight view be taken of the description of the classes of persons occupied in cultivation. The first of these somewhat resembles the middle-man now generally to be found in Ireland. They rent large portions of land at a money price, and either let it out again to sub-tenants, who work it, if in small lots, by means of their own family, with an additional servant or two, or, if large, by day-labourers and their families, who are established on the property.

The next class is called *Affitjuoli*, or farmers. These are the most advantageous to the proprietors, and they are tolerably numerous, as well in the Venetian as in the Lombard provinces. In this class is comprehended the farmers in the watered provinces, whose chief object is the making of cheese, in some cases combined with the culture of rice. These lay out large sums at first, and have a good stock of cattle and utensils, and a sufficiency of capital. The advantage of this class to the proprietor is obvious. They take from him the labour of superintendence, and all risks from failing years and from loss of cattle; and, having leases renewed every nine years, they can have no inducement to destroy the fertility of the soil. Though many of them have more extent of land, the greater proportion may be described as occupying from seven to twenty-five acres.

The third, and by far the largest class of all, are the *Coloni*, colonists, sometimes called *Pigionanti Chiusuranti*, who occupy from three quarters of an acre to an acre and a half of land, with a cottage, or more correctly a hovel. These premises they take either of the proprietors, of the middle-man, or of the farmers, and pay a rent by a share of the produce. They are in fact day-labourers, and, besides what they pay in produce, must work for their superior at a lower than the customary rate of wages. Some of these, however, have a little larger extent of land, but rarely so much as two acres. Such a one pays to his superior a fixed quantity of corn yearly, or commutes that for money, and an agreed proportion of the other products, such as wine, or in many cases the whole of it is divided. When these shares are not too small, and the ground is fruitful, the most common custom is to pay a distinct measure of corn, and the half of the wine. The meadow-land is paid for in money, in silk-worms' eggs, or in cocoons. The cattle, perhaps a cow and a donkey, are furnished to the colonist on credit, and if his terms are favourable, and he gets forward, he becomes the proprietor of them, as well as of the utensils; but if the land is unproductive, or the shares of the proprietor too great, he must give up the cattle and the utensils, and may then be permitted to continue on the land, giving to the proprietor at least one half the produce, or, if the crops prove heavy, a still larger share.

The farmers of the great estates in the watered provinces are in prosperous circumstances, and generally well educated persons; and their chief occupation consists in overlooking the workmen, and making the due bargains for the disposal of their produce. They are also necessarily furnished with some capital, as a proof of which, one near Lodi, occupying a farm of 250 English acres, upon which were fifty-eight cows, a bull, and eight horses, and who had on hand the cheese made in the six preceding months, asserted that the value of his stock exceeded eight hundred pounds sterling. On that farm there are twenty-two families of day-labourers. Six or seven men, the heads of those families, are in the constant employment of the occupier, either as herdsmen, ostlers, or stable-servants. All the rest and the females and children are only employed when there is work to be done, for which they are paid daily wages, viz. to the men about fourpence halfpenny a day, to the women threepence, and to the children from twopence to threepence, according to the age or strength. They have also one meal a day, consisting of rice and beans, but no wine, and only milk one day in the year. Some of them are occupied, on fixed terms, in rearing articles that require a great portion of labour to prepare them, and receive a proportion of the product. Thus, of flax they receive one half, of maize one third or one fourth, and of rice one seventh. Their condition is generally very wretched, though when not wanted they may get occasional wages on neighbouring farms. They are, however, frequently in want of the common necessaries of life, are miserably clothed and housed, in case of sickness can obtain no medical relief, and are utterly destitute of instruction. In spite of the checks, the population is as rapidly increasing as in those parts of Europe where the labourers are placed in more favourable circumstances. The only alleviation to their accustomed wretchedness is but a temporary one during the time the silk-worms are at work, or have finished their spinning, and the silk is to be wound from the cocoons. In most of their habitations they hatch a few eggs if they can find money or credit to buy mulberry leaves; and if not, they have some occupation in winding the silk for those who are a little better situated.

In those provinces of Lombardy which are not to any extent capable of irrigation, there are few large farms, and no substantial or intelligent farmers. The greater portion of the land is divided into small allotments of a few acres, either directly by the proprietors, or through the management of middle-men. The real cultivators, called also colonists (*coloni*), with their wives and children, perform all the labour, and contract to deliver half of the raw produce to the proprietor. Their condition must be worse than that of day-labourers in other countries. It is obvious to any person who has attended to the subject of husbandry in any part of Europe, that the cost of labour in cultivating corn must amount to more than half the value of the produce where the labour is in part performed by horses or oxen; but in this case all is done by human hands, and it must be of more real cost, and consequently the landlord draws more from the land than his due proportion, and that is at the cost of the sweat of the brow of his tenant. On land in England of such a quality as to bear three quarters of wheat per acre, and which could be sold at 56s. per quarter, no farmer would contract to pay one half or one quarter of that quantity as rent, even if the landlord paid the taxes; and the corn-land in Lombardy requires quite as much labour as it does in England. The rapid increase of population, and the difficulty of day-labourers finding employment, are such, that no proprietor finds himself at a loss to get occupiers on the metayer principle. It may perhaps arise from the nature of these contracts, that the owners of land are rarely the cultivators. The few who have attempted to cultivate have soon discovered, that though by hiring day-labourers, and farming in a better style, they obtain more raw produce, they draw from their estates much less net proceeds than they can now extract from them by means of the slovenly cultivation of their ignorant and suffering colonists. This description of tenants are as much bound to continue in their state of poverty and dependence as the slaves on the estates in Russia, or those who were till recently feudatories under the nobles of Germany. If the trifling property they possess is merely equal to the debt they owe their landlord, it is impossible for them to remove; and if they could remove in a state of destitution, it would be difficult to procure land elsewhere. The moral degradation produced by this system is not one of the least evils it generates. A constant struggle is going on to defraud the proprietor of that part of the share which is conditioned to be delivered to him, and the tenant feels no remorse at the fraud, but justifies it to himself by the hard terms upon which the land is let to him. All friendly intercourse is destroyed, the proprietor looks on the colonist as a thief, and the latter views the former as an oppressor. The depravity thus begotten tends to fill the country with numerous offenders against the laws, chiefly amongst the ruined colonists, who have nothing left when expelled from their narrow pieces of land but to take refuge in open or secret robbery.

The picture here exhibited, though a representation of the far greater portion of the peasantry of Lombardy, has some, but not numerous exceptions. Instead of one or two acres of land, a few tenants have from fifteen to twenty acres, and are enabled to keep two or three cows, which are stall-fed, and perhaps a horse or a mule. The cattle and utensils are their own property. They pay a moderate money-rent for the corn-land, and divide with the landlord in equal portions the wine, and the cocoons of the silk-worms. Such persons, if they perform the work by the members of their own families, subsist chiefly on maize, use none of the wine, and otherwise practise the most rigid economy, though they do not become rich, may live in a respectable and comfortable manner when compared with that in which the great body of the same class exist.

On the whole, the condition of the great mass of the colonists is very far inferior to that of the lowest class of agricultural labourers in England, France, or Germany, and nearly resembles that of the most wretched of the cottiers of Ireland.

The chief product which is furnished by Lombardy to external commerce is silk, which interests more or less every family in the country, and receives the greatest share of general attention. As the quantity and the quality of the silk depend on the worms that spin it, the subsistence of those worms becomes an object which engrosses much consideration. The leaves of the mulberry-tree are exclusively the food of the worms, and the greater weight of these leaves that can be gathered, the greater is the silk that is produced. In many parts are numerous nurseries, where those leaves are raised, with most careful cultivation, from seed. The beds in which the seed is sown are well and deeply ploughed or dug the year before, and manured with the most powerful substances. It is at last dug once more, made as fine and as level as possible, and the seed is then sown in rows about eight or ten inches from each other. It is slightly covered with earth, and also with hay and straw, the latter to protect it equally from the slight frosts which occasionally appear in winter, or from the excessive droughts which frequently occur in summer. In very dry weather they are watered as becomes necessary. As the plants grow, they are carefully weeded with the hoe, and are also thinned out. They grow but little in the first year, but considerably in the second, at the end of which, or at the beginning of the third year, they are transplanted from the seed-bed to the nursery-garden, and cut close to the eye. In the next year they are again cut close, and the stump grafted. In the fourth year, when the new shoots have formed what is to be the crown of the tree, they are cut into a hollow so as to resemble a basin, which is found the best shape, both for the fruit and the leaves. In the fifth year they are generally sold; or, when the nursery is kept by one who means to plant them on his own property, they are transplanted to the hedgerows or other spots where they are intended permanently to remain. The growth of the plant up to this period depends mainly on the manure which is applied to the nursery, but generally they have attained a diameter of from four to five inches.

The wild mulberry, or *Morus Alba*, yields the best leaves for the nourishment of the worms, and the silk they spin whilst feeding upon them is of the finest quality; but the quantity of leaves they yield is so small, that it requires a great outlay and a great number of trees to give sustenance to an extensive silk establishment; on which account they are grafted with other kinds of mulberry-trees, which have larger and dark-green leaves, and in such abundance that they yield at least double the weight of leaves. Attempts are now making, and experiments in progress, for obtaining a new genus of the mulberry-trees, which may unite abundance of leaves with greater fineness in the silk. According to Moretti, professor of botany at Milan, the finest silk is obtained from the wild ungrafted mulberry-tree, the next finest from one of a new genus produced by his experiments, the third from the grafted white mulberry, and the coarsest from the black mulberry. The fruit of none of these trees is in any estimation. In order to procure more leaves, the cultivators of the trees, every fourth year after the leaves have been stripped, cut off all the smaller branches quite close to the principal ones. In the succeeding year the leaves are not taken from the new shoots, but they are in the next and following years; and in the fourth year, when the shoots have attained a diameter of four inches, they are as bushy and thick as if they had not been tapped.

It is difficult to form an average of the produce of mulberry leaves from each tree, as much depends on the soil, but more upon the age of the tree. As soon as they have attained six inches in diameter, they yield from 19 to 27 lbs., and continually increase their produce till they attain a diameter of two feet, when they yield from 220 to 260 lbs. Having then attained their full growth, they continue to increase in produce till they yield in some cases, but extreme ones, as much as 500 lbs. The market prices of the leaves undergo a great fluctuation, varying sometimes one hundred per cent in a fortnight. In June of the year 1833 they were sold at 3s. the hundredweight, and two weeks before at 7s.

Some persons who have none, and others who have but few mulberry-trees, yet breed silk-worms. They are careful to make contracts for what they expect to want, in March or April, when they are cheapest. It not unfrequently happens that by a storm of hail, which is not an unusual occurrence, the price is so raised that the breeder, instead of drawing a profit from his operations, finds he has paid more for the leaves than he can obtain for the cocoons. There are persons so skilful in estimating in the spring the weight of leaves which each tree will produce, that their assistance is commonly resorted to by those who make bargains for the leaves. When the first signs of life begin in the worms they eat very little, but when they begin to spin they require a considerable quantity of food. The price of leaves naturally rises very high; and if at that time a hail-storm should occur, the advance becomes most ruinous to those who are compelled to purchase. In general the mulberry-trees are, by the terms of the leases, let to the farmers or colonists, who divide the cocoons equally with the proprietors of the land. The tenant provides half the eggs, and superintends the insects, feeding them, and keeping them clean whilst they are working; the other half of the eggs, as well as the leaves, are the contributions of the landlord to this equally joint-stock concern. The tenant estimates what worms can be nourished by the quantity of leaves the trees upon his farm will feed, and the two parties procure the estimated weight of eggs. If the tenant miscalculates, or if a hail-storm destroys his calculation, he is bound to purchase such a portion of leaves as will subsist the insects through their working period.

The planting of mulberry-trees, and the consequent produce of silk, have been favoured by circumstances which have naturally led to a rapid extension of every branch of that trade. It is an object of attraction to every grade of society, from the greatest landholder to the lowest of the colonists and day-labourers; and these have all been stimulated by the constantly advancing price of the raw silk in each year from the return of tranquillity in the year 1814 to the present time; but the most striking advances of price were those which took place from 1820 to 1822. From the vast number of trees, only an approximation to the rate of increase can be made. It has, however, been ascertained of late, that three fourths of all the mulberry-trees of Lombardy are of less than thirty years growth, and that one half of that three fourths, consequently thirty-seven per cent. of the whole, are under fifteen years of age. The greater portion of the mulberry-trees in Lombardy are to be found in the dry provinces, though some few are planted in the irrigated districts. From the city of Milan to Varese, from that city to Como, between Lecco and Bergamo, quite to the river Adda, the cultivation of vines has almost everywhere given place to that of mulberry-trees. One of the finest views in Italy is from the high ground about Bergamo, which comprehends the hills of Brescia and Bergamo, and the extended plain of Lombardy. Around the city the appearance is that of an extensive orchard or fruit-garden; but the trees are planted chiefly for the leaves, and are found, with less annual expense, more profitable than any trees cultivated for their fruit. The lowest calculation of the average profit of the trees makes it, including all ages, from five to fifty years old, nearly six shillings sterling from each tree annually.

In the lower parts of Lombardy, in the irrigated provinces of Milan, Pavia, and Lodi, the cultivation of mulberry-trees, and the consequent breeding of silk-worms, are by no means extensive; yet, even in each of these of late an increase has taken place, and preparations are made, by which it is calculated that in three years the number of the trees will become double what they are at present. The greater number of mulberry-trees are at this time to be seen on the sterile and strong soil in the province of Verona, especially between that capital and Desenzano, and from Castelnuovo, through Vallego, quite to Roverbello. The surface of these districts consists of masses of pebbles, rounded by having been washed down at some remote period from the neighbouring Alps, and in which the culture of corn will scarcely repay the cost of the labour devoted to it. As much land is mingled with these stones, which is favourable to the mulberry-trees, vast numbers have been everywhere planted. A prejudice is said to prevail in these districts against the practice of engrafting, and that owing to it the quantity of leaves does not bear the same proportion to the number of the trees, as in the other parts of Lombardy.

The eggs of the silk-worms are not preserved by all those who manage their working, but are made an object of trade by a few persons whose establishments are upon so large a scale as to make it worthy their attention, and who, when preserving for themselves, collect greater quantities for sale. They are sold by weight, generally at about two shillings the English ounce; and some individuals have collected in one year as much as 2500 ounces, though one tenth of that weight is nearer the average of the whole of the several producers. The eggs are divided into three classes. The worm from the first of them casts its skin four times, and is of a large size, and an ounce contains 24,024 eggs. Supposing each egg to produce a caterpillar, and each caterpillar a cocoon, as 110 cocoons weigh a pound, the whole ounce of eggs will yield 218 pounds of cocoons. The second also casts its skin, but the animal is of a smaller size, as are the cocoons; an ounce of them contains 25,185 eggs, and the cocoons produced from them weigh less, 216 being a pound, and consequently the whole weight of the cocoons is only ninety-six pounds. The third class casts its skin but three times, an ounce contains 31,004 eggs, 440 cocoons weigh about a pound, and the whole weight of the cocoons is only about seventy pounds.

In every house, room is made for laying out the worms as soon as any symptoms of life appear, and in even the poorest cottages of the colonists, who have but a single apartment, it is so contrived that some space is allotted to them, and the inhabitants shift as well as they can during three weeks or a month. Tables of reed are formed, about two feet and a half in breadth, and from fifteen to eighteen feet in length. These are suspended from the roof, the upper shelf two feet below it, and others at a foot distance, with the lowest of them two feet from the floor. The windows are made of paper, to prevent currents of cold air, and too great heat; the shutters are of straw, and the door consists of a piece of old linen cloth. Within, the place is kept in darkness, except when the worms are to be fed or the place cleaned out, when lamps are used. In many of these places, thermometers, made for the express purpose, are kept to ascertain the temperature. They are made of spirits of wine, and show no other change of heat than that between the 16th and 20th degrees of Reaumur, to which limits it is deemed necessary to confine their range of temperature. In the houses where there are none of these simple instruments, habit has given a tact, by which the people ascertain the degree of heat with tolerable accuracy.

Some of the colonists within a season produce as much as 140 pounds of cocoons. Taking their half of them at seventy pounds, and estimating them at the average price (for there is great variation in the price), viz. two shillings and threepence per pound, it will yield for a month's labour near eight pounds, which is an enormous sum for persons in that condition of life in that country. From it, however, must often be deducted the cost of leaves, when the landlord's trees do not yield as much sustenance for the insects as the tenant has calculated when purchasing the eggs.

The rapid growth of these insects is one of those singularities in natural history which seemed to be worth collecting and recording, as is also the increased space they occupy, and the increased portion of food they devour, in the several periods of their short existence. From their escape from the shell to their death is commonly thirty-two days, which is usually divided into five periods, according to the change observable in them, thus:

1st period	5 days.
2d do	4 do.
3d do	6 do.
4th do	7 do.
5th do	10 do.
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The space required for an ounce of the eggs is, in the first period, $2\frac{28}{100}$ square feet; in the second, $4\frac{56}{100}$; in the third, $10\frac{83}{100}$; in the fourth, $25\frac{65}{100}$; and in the fifth, 57 square feet. According to a course of experiments made by Count Dandolo, it appears that the weight of 100 silkworms at the different periods is as follows, viz.

100 at their first appearance	648	grains.
100 at the 1st period	9,726	do.
100 at the 2d ditto	60,912	do.
100 at the 3d ditto	259,200	do.
100 at the 4th ditto	1,051,700	do.
100 at the 5th, when they have attained their greatest weight and size	6,156,000	do.

Thus, in the thirty-two days they have increased nearly 9500 fold. The same course of experiments shows the weight of mulberry leaves which is given to the worms produced from one ounce of eggs to be as follows:—

n the 1st period	$3\frac{5}{10}$	pounds.
n the 2d ditto	$10\frac{5}{10}$	do.
n the 3d ditto	35	do.
n the 4th ditto	105	do.
n the 5th ditto	640	do.
Total	794	do.

As the leaves are kept at least one day, and sometimes nore, after they are gathered, they have lost by drying sixty-one pounds, and by cleaning from dirt and small sticks eighty-three pounds, so that to supply this food 939 pounds of leaves must have been procured. It is found in cleaning the insects, that the remains of the leaves which are not consumed, consisting of thick stalks in the middle of each leaf, and some of the relics, weigh 329 pounds. Thus the actual food is 465 pounds. According to those experiments, as seventy pounds of cocoons were procured from the ounce of eggs, each pound must have required $11\frac{35}{100}$ pounds of leaves as they come from the trees, or $6\frac{64}{100}$ of real vegetable nourishment. The obtaining the cocoons is a step of great importance in the whole operation of procuring the silk. With the small producers, and it is they who, after all, furnish the far greater quantity, their labours are for the most part at an end, as they generally sell them to other persons, who make the winding the silk, and the subsequent operations to fit it for the manufacturer, a distinct trade. There are, however, some few large establishments, in which the silk-worms are nursed, and in which the cocoons are wound off, and all the steps taken to prepare the silk for market. It would lead to some very long description and discussion, to show satisfactorily and accurately the relation which exists between the quantity of leaves and the weight and number of cocoons, and also the relation between the number and weight of cocoons, and the actual weight of silk prepared for the manufacturer. It has been minutely discussed by Dandolo, with whose results this part of the subject may now be closed. One hundred pounds weight of cocoons yield about eight pounds and one third of silk. The thread drawn from each cocoon must be about 800 feet long to weigh a grain. Each of such cocoons yields nearly one grain and a half of silk. One pound of them will produce in length 17,600 feet. It requires about one hundred and fifty pounds of mulberry leaves to produce one pound of silk.

It is difficult to ascertain the quantity or the value of the silk annually produced at present from the soil of that part of Lombardy contained in what is now within the boundaries of the government of Milan. Much of it is consumed within that government. A much larger portion is sent, without any official notice, to be manufactured in Austria Proper, in Bohemia, and in Hungary. The greater part of what goes to the Prussian factories on the Lower Rhine, as well as that for France and for the English market, passes by land-carriage; and the accounts, not being kept for purposes of revenue, are not collected with exactness, nor brought into a focus. The only account whose authenticity can be relied on, is an official paper transmitted to Vienna for the year 1824, since which period the growth of silk has been constantly and extensively increasing.

Worms.	Imports.	Exports.	Value of Imports.	Value of Exports.
Cocoons	128 quintals.	1,179 quintals.	83,738	827,507
Raw silk	30,548 pounds.	312,899 pounds.	1,619,054	17,522,377
Spun silk	93 do.	634,593 do.	5,998	41,883,144
Other kinds	590 do.	9,113 do.	7,269	764,380
Manufactured silk goods	...	...	...	3,291,896
			1,716,059	64,289,304
				1,716,059
				62,573,245

This account is made out in Austrian lire, of which hirty are about equal to a pound sterling, and thus give ne excess of the value of silk exported above that imorted as L.2,085,774 sterling. Considering the increase of mulberry-trees within the last ten years, and the advanced price of silk, it will not be too much to assume the balance of exports in 1833 at L.3,000,000. After reviewing the productions of most value, the cheese and the silk, Lombardy. a slight notice may be taken of the results of those other operations of agriculture, which are almost exclusively confined to domestic consumption.

Amongst corn, that most extensively grown is maize. It is the chief nourishment of the working classes, and is deemed by them the most healthy and most strengthening of all grain. It has, too, the advantage of being most easily converted into wholesome food, requiring, unlike wheat, no assistance from the baker. It requires only a kettle and a little fuel to make it into polenta, a kind of thick pudding or gruel, which, without any addition, forms the common food of the peasantry. It is also a valuable product on other accounts. The grains in a green state are a substitute for green peas; the leaves, when fresh, are a fodder, on which cattle eagerly feed, and, when dry, they are used to make excellent beds, or rather mattresses; the stalks are used for fuel in that country, where fuel is scarce; and, finally, the feathery tops are converted into brushes for sweeping the houses.

This article is also cheaper than wheat, being commonly sold at about two thirds the price of that grain; but, from its being the food of the far greater part of the population, in seasons of great scarcity, such as those following the harvest of 1816 and 1828, the indispensable demand for it caused the price to rise higher than that of wheat. From the circumstances here stated, more than one third of all the arable land of Lombardy is destined to the cultivation of this grain, and the average product per acre is greater than that of wheat. It is grown almost indiscriminately on all kinds of soil; and the nature of the climate is but little regarded, as it is to be seen equally on the cold hills, and in the warm valleys of the provinces. The culture of it does not appear to have received any improvement since its first introduction. It is in some cases sown broadcast, and covered in with the plough. From this mode of sowing it, it can only be cleared of weeds by hand, and the earth is thrown round the plants in the same way; whereas, in the countries where it is sown in rows or drills, these operations can be more advantageously performed by appropriate instruments. The expense of this hand-hoeing and shovelling up the earth is said to be equal to the value of one third of the gross product of the crop. It is customary, after the bloom is off, to strip the plant of its leaves, and also to cut the stalks above the cobs or ears, which, if not done too early, is not injurious to the grain. There are several species of this plant. The most common is that with a large yellow grain, whose cobs grow about half way up the stalk, and which ripens in three months, if sown in the month of May. If it cannot be sown so early, or if it is sown after a crop of flax, or on clover after the first mowing, it is usual to sow another kind called brigantino, whose grains are smaller, and of a darkish brown colour. In the vicinity of Bergamo, the greatest quantity of maize is of this kind. There are some species of this corn of much smaller grains, called cinquanto and quaranto, from the number of days which pass between the sowing and the harvesting. These kinds are commonly sown on the wheat stubbles, or after a crop of flax or of rape-seed has been gathered. It is seldom very productive, and, if the field on which it is sown be poor, scarcely repays more than the seed and the labour.

In a country where the soil and the climate are so various as in Lombardy, and where the difference in the quantity of manure applied to the soil is so great in the several portions, it is impossible to arrive at any average calculation of the produce of grain per acre. Nothing more can be done here than to state a few facts on the subject. One very accurate cultivator on the richest irrigable land, to which abundant manure is applied, stated that his crops yielded annually in a series of years from fifty-nine to seventy-eight English bushels an acre. Another also, in the same circumstances, a few miles distant, gave his range of bushels at from fifty to seventy-eight per acre. The other side of the picture is vastly different. According to an official valuation in the revenue office at Milan, the following average of the produce of maize in some of the poorest provinces is given, viz. in Verona, the greatest produce is rated at fifteen bushels the acre; in Vicenza, from thirty-two to forty-two; in Padua, from twelve to twenty-one; and in Udine, from thirteen to twenty-two. No other provinces are noticed in the account. To this account of the average produce of maize may be added calculations made by two of the most accurate agriculturists of Lombardy. Count Dandolo informs us, that the average produce from the colonists on his estates near to Vanese, on whose fields the peasantry had been induced to plant the beans called fisole amongst the maize, was $21\frac{3}{4}$ bushels of maize, and $4\frac{1}{2}$ bushels of beans. The average on the whole of his estate, including the part cultivated by himself, is stated to be $32\frac{1}{2}$ bushels of maize, and $7\frac{1}{2}$ bushels of beans. Another intelligent agriculturist asserted, that, according to the best calculation he could make, and he had taken much pains on the subject, the average produce of maize did not exceed twenty-one metzen the jock, or twenty-five bushels the acre, which he considered to be a produce one third greater than that of wheat.

Rice is a plant introduced from India and China at some distant but not very remote period. According to some, it was known as early as the tenth century; but no one large field was cultivated with it, until a patrician of Milan, in the year 1522, first destined to it some marshy land upon his own estate in the province of Verona. In the provinces of Verona, Mantua, and Pavia, it is the most profitable grain that is grown; and in the provinces of Lodi and Milan it always secures to the farmer moderate benefit. Much of it is consumed at home, as those who do not subsist on maize alone have one meal a day of this article. Some of it is exported, but the amount of that portion does not exceed in value L.12,000 sterling. Rice is a marsh plant, and can only be grown where the land can be covered with water till it warms, and is very slowly dried up. The evaporation is injurious to human health, and hence laws are enacted regulating the distance which must intervene between the rice-fields and the cities and towns. Without these restrictions, rice would be more extensively cultivated. At present about 125,000 English acres form the extent of this culture. Some portion of rice is grown in the rich provinces, as one of the crops in rotation of convertible husbandry. In this practice, called *risare a vicenda*, it is most commonly sown after clover. The land is ploughed very deep, but not harrowed. The water is then turned on, so as to cover the surface, and to show any inequalities which remained by the use of the spade. The seed is then sown, or rather scattered on the water, having been previously steeped during eight or ten hours, to give it additional specific gravity, so that it may sink immediately to the bottom. If it were sowed after clover, two bushels of seed would be sufficient for one acre. When it is sowed, as is oftentimes the case, after maize, the quantity is usually three bushels.

The time of sowing is from the beginning of April till the middle of May. It remains covered with water to the height of from two to three inches, and in that state remains till weeding becomes necessary. That early sown requires the operation to be performed in the middle of May, that later sown, some time in June. It is executed chiefly by the females, who, with their lower garments tucked up, stand in water over the ancles, and with the hand pluck up the weeds by the roots. If the land were dry, the weeds would break off, and leave the roots to shoot out again. The most prevalent weed is the cockfoot grass, which, at an early period, it is difficult to distinguish from the rice. Besides this, there are several other weeds, chiefly of the rush kind. In the first year the operation of weeding is performed twice. If the same field be sown with the rice in the next year, once is deemed sufficient. This is the most expensive part of the process, and is said in the first year to require twenty-five days' work for an acre, which, as the employment is unpleasant and unhealthy, is commonly paid for at the rate of about tenpence per day. Much of this work is executed by the colonists upon plans marked definitively in their leases. The terms vary excessively, according to the locality and the soil. A common plan is, for the colonist to receive one quarter of the gross produce, after the quantity used as seed has been abstracted from it. For this he is bound to perform the following portions of the labour, viz. the levelling the surface, the sowing, the weeding, the reaping, and all the labour not performed by cattle, until the crop is placed on the threshing-floor. In the case of some of the poorest land, the colonist receives one third, instead of one fourth, of the produce. About midsummer-day the water is allowed to run off the land, and during eight or ten days it is suffered to become dry. This is done to destroy the numerous water insects, which would prove injurious to the roots of the rice, and cause it to fall into the water.

Some few persons have, however, of late abandoned this practice of letting off the water, and say it is advantageous to the perfecting the grain. In common cases, at the end of this drying, the field is again covered with water, and it continues until the time of harvest, which is usually the first week of September. It is reaped, bound in sheaves, and carried to the threshing place, where it is commonly trodden out by horses. When the rice has been trodden out, it is exposed to the sun to dry it for a few days, and carried to the place where, by stamping in a kind of mortar with wooden pestles, it is cleared from the husks, which are separated from the grain by appropriate sieves, through which it is frequently poured. If the rice is very good, it yields, when stamped, about one half the measure it did in the raw state. If it yield but one third, it is considered as scarcely marketable. The product of rice, as far as can be gathered from the returns of the crops in various years and various localities, is surprisingly different, and there seems to be no means of forming any approximate average. The following are all the acts that could be collected on the subject.

Places.	Lowest Quantity per Acre in Bushels.	Highest Quantity per Acre in Bushels.
San Novo	$51\frac{5}{10}$	96
Tavezzano	$54\frac{3}{10}$	$102\frac{3}{10}$
Viltadoni	46	$120\frac{1}{2}$
Ronearo	44	82
Verona	35	$47\frac{1}{2}$
Ditto	33	46
Grigolate	$29\frac{1}{2}$	51

These are the quantities of rice before it was cleaned from the husks, and from which one half must be deducted, to give the produce in marketable rice.

Wheat is a grain cultivated upon a small scale in most parts of Lombardy, excepting in that portion of it which comprehends the mountainous Alps. It is not, however, a plant which succeeds to the same extent as it does in climates somewhat colder. There is but one species of it sown in the whole of the province. It is a winter wheat, sown between the first week of October and the first week of November; but the best farmers wish to finish their sowing by the 21st of October, if the season permit. The wheat is all of the bearded kind, the preference of which has been owing to the opinion that the beard is a protection against the fogs of the blooming season, and against the depredations of the small birds at the time of the grain ripening. The produce is a kind of wheat harder than that of the west and north of Europe, but less hard than some of the wheat from the Black Sea. From this circumstance it is better calculated to be converted into maccaroni than our wheat would be, for which purpose it is much more frequently pounded in a mortar than ground at a mill. The product of the crops is less per acre than it is generally in the German dominions of Austria, and considerably less than in England or in the best parts of the Netherlands.

It is of course most productive on the best lands of the rich provinces, where irrigation is practicable to the exact extent which the nature of the crop may require. On that description of soil it is less profitable than other crops, and, therefore, only a small portion is applied to its growth; but even on the best of that land it is a rare event to obtain sevenfold the quantity of the seed that has been sown. On the farm of Tavezzano, one of the best cultivated in the province of Lodi, the average produce of the wheat land in the past year had been twenty-four and a third English bushels the acre. In the farm of Viltadoni, near to it, the report was, that three and a fourth bushels per acre had been sown, fifteen and a half reaped. Berra, in his work (*Sull' attuale Avvilimento del Prezzo di Grani*) published in 1826, calculates the increase of wheat in the dry parts of Lombardy to be only at the rate of four and a half times the quantity of the seed. In plain figures reduced into English measures, he averages the seed sown to be two and a fourth bushels per acre, and the crop gathered nine bushels and three fourths. The late Count Dandolo estimates the produce higher, and concludes that, with the common culture, the increase of wheat is about five times the seed, or that three bushels an acre are sown, and fifteen bushels reaped. He does not state what the increase had been on his own land, which was highly cultivated; but it appears, without being informed whether he sowed thicker or thinner than his neighbours, that he usually had a crop of twenty and a half bushels. In the neighbourhood of Mantua, where the poor colonists grow wheat and maize in alternate years, where the soil is sandy, and where, from the paucity of cattle, little manure is applied, it does not appear that the crop of wheat grown more than equals four times the seed. In some of the other provinces of the part of Lombardy within the government of Milan, as well as in some of those in the Venetian government, the report of the officers employed in making a new valuation or cadastral, and who had been occupied three years in examining the state of the produce for financial purposes, was obtained. As it was the business of these officers to examine only the produce, no proportion is stated between the quantity of the seed and that of the result.

In Verona, the higher part of which is stony, and the lower part sandy, the best of the land yields ten bushels, and the worst only six and a half. In Vicenza, where the soil is better, the lands of the first quality yield eighteen bushels, those of the second fifteen, the lowest twelve. In Padua, the first class of lands yields fifteen and a half bushels, the second eleven and a fourth, and the lowest class only seven bushels. In Udine, a poor sandy soil, mixed with many pebbles, and where there are but few cattle, the first class of soils yields ten and a half bushels, the second nine, and the lowest only six and a half.

It is not easy to ascertain what portion of the fields is appropriated to the growth of wheat. It appears by the appendix, that the whole land under the plough is 1,461,700 English acres; of this portion, 125,000 acres are cultivated with rice. On the best of the soils, according to the regular rotation of crops, one half of the land is in grasses, the proportion of maize is greater than that of wheat, and some portion is sown with pulse, rye, millet, oats, flax, hemp, and other kinds of crops. The whole portion sowed with wheat does not probably exceed 200,000 acres, and the best judges estimate that such is nearly the extent. If, then, the crop be calculated to yield on the average two quarters to the acre, it will afford 400,000 quarters. If from this be deducted what will be required for seed, being about a fifth, or 80,000 quarters, it will leave as food for 2,500,000 persons, at the rate of little more than one bushel for each, or about one eighth part of what is usually considered as the annual consumption of each individual in England. From the great articles of human consumption being so different, a comparison seems unnecessary; but it may serve to illustrate a general principle of great importance, viz. that consumption and production so act upon each other as constantly to tend towards an equilibrium. Hence we may infer, that few countries extend their growth of articles of the first necesssity far beyond what their own population require.

The other kinds of grain are but very little cultivated. Barley and oats are scarcely needed. They are never used as human food, and neither is any beer brewed, nor any corn-spirit distilled. A little rye is grown upon some poor districts, but it yields a very low price, and the quantity sown is every year diminishing, as the taste of the people changes in favour of maize. Millet is grown, but is not deemed a profitable crop, except occasionally, when it comes to maturity, which it sometimes does if sown in stubble after the harvest. Buck-wheat is known only in or near the Alpine districts, and is but slightly attended to.

The plants which do not serve for food are not of any great importance. Though flax is grown chiefly for the employment it gives in spinning and weaving, yet some oil is made from the seed, as also from rape, and the seed of other plants of the brassica kind. The hilly regions abound with several kinds of nuts; and chestnuts form an important portion of the sustenance of the poorer classes of the inhabitants. The walnuts and hazelnuts are converted into a fine oil, much valued by painters; but the demand for it, as well as the supply, has been gradually declining of late years. Scattered olive-trees are to be seen in most places between the hills and the lake of Garda, and a few olive gardens on that and the lake of Como; but the quantity of oil expressed from them is very insignificant. As none of the trees have been planted within the last sixty years, their number has diminished, and is still constantly diminishing. The inducement to extend the growth of mulberry trees and of vines is so much more powerful than exists with regard to olive-trees, that the latter are almost neglected, and more especially as the parts of Italy to the south of Lombardy in contact with it have a more genial soil and climate, and can render olive-oil upon more beneficial terms than it could be produced if much extended within that territory.

Few things are more striking to a visitor in Italy from the north of Europe, than the straight rows of trees of all kinds that run through the corn fields, at the foot of which vines are planted and trained, so as to extend in elegant festoons from one tree to another, exhibiting the pendant clusters of grapes. If the same mode of training the vines were attempted in the somewhat colder climates of France and Germany, it is thought the shade of the trees would prevent the grapes from ripening. This effect is not produced in Lombardy, where the berries become ripe, and, when eaten, are of good flavour; but the wine produced from them is in general of a bad or very indifferent quality. Though much of the wine is produced from such vines in the corn fields as are distinguished by the names of *Campi Arative Vitati*, or of *Campi Arborati Vitati*, and others from vines planted in rows at such a distance from each other as to admit of maize being grown between them, and called *Ronchi;* yet in some parts are vineyards properly so called, because, like those of France and Germany, they alone occupy the ground, and are, like them, supported by props. The greater part of the best wine, however, is produced from the *Ronchi.*

The wine generally in Lombardy is of a very bad quality, which is attributed to its production being left almost exclusively to that description of cultivators before noticed under the name of colonists. These exercise little discretion and little care, either in the choice of the kind of grapes they plant, or in the management of the juice when it is expressed from them. Their chief care is to obtain the largest quantity, without much regard to the flavour or the aptitude of keeping; and commonly, as soon as it is made, they divide it in equal shares with their landlords. One cause to which the inferiority of the wine is attributed arises from the general predilection in favour of red wine, or, as it is called, *Vin Nero*, which is prized according to the darkness of its colour. In order to produce this deep colour, the skins of the grapes are left, in the first part of the process, to ferment with the juice. Sometimes this is suffered to continue during eight or ten days in a vat before the liquor is drawn off, and sometimes still longer, as the longer it continues the darker the wine becomes.

There is no old wine in Lombardy, except, perhaps, in small quantities in the hands of a few amateur proprietors. The wine of each vintage is sold in the course of the following year; and when any of it is kept, even though it should not have become, or show a tendency to become, vinegar, it will sell at a lower price than new wine, because it is milder, and more agreeable to the taste of the consumers. It would be as difficult to estimate the quantity of wine made annually in Lombardy, as it would have been fifty years ago, if no duty had been paid on malt, to have calculated the quantity of malt liquor of all kinds made in England; at which time almost every family out of London brewed its own beer. From a long list of the number of vines, and their produce in wine, of several farms of various soils, around the corn-fields of which the vines had been trained to the trees, it appears that in the most productive, the highest produce was 122 gallons from 100 vines; that in the least productive year, from that number of vines only thirty-three gallons were produced; and that on the average of thirty-one such farms, every 100 vines yielded fifty-one and a half gallons of wine.

In the vineyards properly so called, the vines are, like those of France and Germany, supported with sticks. Each vine, of course, produces less than those trained from one tree to another. From a return of the produce of fourteen such vineyards, it appears that the quantity yielded by the lowest was thirty-two gallons, and the average of the whole seventy gallons to the acre. As wine is not an article of export from the province of Lombardy, but, on the contrary, much is imported from the other parts of Italy, and, for the few who indulge in such luxuries, some from France and from Germany, it has been looked upon, whilst drawing up these notices, purely in an agricultural point of view. It would have been easy to have given more details respecting the preparation, but it seemed to be more proper to leave that part of the subject to such persons as may be employed in writing the history of vines, than to enter into it in this place.

Potatoes, which form so important a part of the food of the inhabitants in the more northern parts of Europe, are very little cultivated in Lombardy. They are almost exclusively confined to the Alpine districts, or, when grown on the level country, are confined to the gardens. The absence of this root is a subject of sincere regret to the most patriotic individuals who have devoted their attention to rural economics. Count Dandolo attributes much of the dreadful consequences which followed the deficient harvests of 1816 and 1828, when great numbers perished from want of common necessaries, to the absence of that seasonable supply of food which potatoes would then have furnished. Others have made similar and ineffectual remarks. The taste for polenta is much too deeply rooted and the dislike to potatoes so common amongst the working classes of the rural districts, that there is no present prospect of their cultivation being speedily extended.

Specification, from an official Document, of the Appropriation of the Cultivated Lands in Lombardy, in the year 1831, *rendered into English Acres.*

Delegations or Provinces.	Arable Land.	Rice Land.	Meadows.	Gardens and Orchards.	Vineyards.	Upland Pastures.	Woods.	Total.
Milan	157,544	13,193	56,844	17,114	120,583	16,999	42,166	424,446
Bergamo	162,448	3,149	99,283	2,623	55,237	126,995	267,062	716,817
Brescia	277,380	4,848	85,685	4,262	91,440	71,351	193,996	728,462
Como	92,922	……	61,021	2,692	92,165	88,519	191,076	528,401
Cremona	222,624	16,816	57,562	8,039	124,905	11,513	111,902	453,361
Lodi with Crema	147,770	11,746	110,042	3,514	33,441	11,979	20,446	338,938
Mantua	282,119	24,709	87,096	7,805	204,820	25,381	8,191	640,118
Pavia	100,141	51,481	80,386	6,118	53,935	5,594	20,783	318,438
Sondrio	13,820	……	36,241	716	15,789	217,503	251,372	535,441
	1,456,768	125,442	674,160	52,889	792,315	575,834	1,007,014	4,684,422

The most important tax is the territorial impost. It is an ancient payment, which has been alike collected under the several changes of rulers which have administered the finances of the country. It has resisted all general attempts to equalize its rate according to the productive powers of the soil, and therefore falls in a very unequal degree upon different estates. Attempts have been constantly making, and still are in progress, to equalize this impost; but the pace of the commissioners appointed for the business is so very slow, that no one can form an opinion of the period at which the work will terminate. It will not be possible here to give more than a general view of the amount of this tax. The province of Milan extends over 16,500 square miles. Of this, the roads and the water are 730, and of the remainder, one quarter is estimated to consist of sterile rocks, of miserable pasture, or of more miserable woods, yielding no produce worth collecting. This would leave of all descriptions of valuable land to the extent of 11,830 square miles, or about 7,370,000 English acres. The whole amount of the tax is 26,171,338 lire, or, taking the lira as the thirtieth part of a pound sterling, is L.872,374, or about 2s. 2d. per acre. In estates in the province of Lodi the amount of whose tax is clearly stated, it amounted in one instance to 3s. per acre, in others to 2s. 10d., in most to 2s. 6d. In the province of Pavia it amounted in one instance to 7s. per acre, in others to 6s. and in several to 4s. 6d. In the province of Milan some estates near the city were made to pay as much as from thirty-eight to forty-one and a fourth per cent. on the actual rent. The estates here referred to were the best land, and the best cultivated; and those he highest taxed were in that condition when the last survey was made. These prices, so high above the aveage, make up for the little value of the extensive parts of he poor land of the other and larger six provinces. As his impost is collected in all cases from the proprietor, it s regularly paid, and attended with little cost in the collection.

It is generally believed that more than five sixths of the nhabitants of Lombardy subsist wholly by the labours of he field. Of these, the far greater proportion are of the decription which is here called colonists. They are small occupiers, dividing the trifling products of the soil with the proprietors. Their condition is far worse than that of day-labourers in this country, for they have no resource in case of a deficient harvest but beggary or starvation. Their dwellings are small and miserable; they are without furniture, utensils, or the means of cleanliness. They generally marry early, and have families, though they have no prospect of supporting them, beyond the hope that the half of the produce of maize on an acre of land may yield them food during the year, with the exercise of the greatest parsimony in its use. In the event of sickness they have no relief; and their clothing is deficient, and of the coarsest materials. The charity of those who can afford it is bestowed with as fair liberality as can be expected, considering the numerous claimants that offer for its reception. The worst part of this picture is, that no hope is entertained of bettering their condition, and no means of doing so attempted to be put in practice, either by public bodies, such as monasteries, which formerly existed, or by the government, or by private associations of individuals.

The mining operations are inconsiderable, and are confined to the procuring of iron in the Alpine valleys of Bergamo and Brescia, and of copper in Belluno.

The manufactures of Lombardy are extensive; that of silk gives the most employment, but very large occupation is afforded by the linen and woollen trades, and in both those branches the use of machinery has been widely diffused. Woollen goods of almost every description are made in the delegations of Venice, Padua, and Como. Milan has been from remote times celebrated for its weapons and arms, and iron work of all kinds is still extensively made in the delegation. Besides the great branches of manufacture, most of the smaller ones are carried on, especially those of paper, glass, gold and silver articles, and domestic utensils.

The foreign trade is not material; that of Venice has much declined since its union with Austria, though some of the smaller articles of that division are still dispersed throughout the eastern countries. There are still many ships navigating the Adriatic and the Mediterranean Seas, now bearing the Austrian flag, which are built and equipped at Venice, and at the other ports under the dominion of that power. The following table will show the extent of the foreign trade.

An Account showing the Value of Goods Imported and Exported in 1824.

	Imports.	Exports.
Groceries, including coffee, sugar, and spices	7,163,737	185,966
Drugs	1,129,308	244,539
Paints and dyers' colouring articles.	1,544,745	66,243
Cattle of all kinds	10,275,481	728,120
Wines, liqueurs, spirits, and eatables	15,011,384	1,413,544
Wool, hair, and goods made thereof	1,042,311	2,502,819
Flax, hemp, and goods made thereof	1,585,002	368,494
Skins of animals, and goods made of them	2,188,573	151,718
Wood and wooden-ware	1,158,002	293,080
Metals and metal articles, except iron	161,621	369,801
Various others, most small wares...	5,387,803	1,508,596
Silk and manufactured silk goods...	1,716,130	64,290,939
Corn and pulse	2,319,189	3,085,729
Cheese	633,910	3,513,043
Linen, yarn, and twine	208,536	3,094,694
Cotton and cotton goods	2,815,529	179,075
Iron and iron goods	106,207	1,212,869
	54,447,768	83,209,320

Note.—The above account is made up in lire, of which thirty are about the value of the pound sterling; according to which, the excess of the exports beyond the imports amounts to L.958,000 sterling.

The government is almost an unlimited monarchy; for although, by the constitution of April 1815, there are both central and provincial assemblies of representatives of the people, their function is rather to form rules for the execution of the laws promulgated from Vienna, than to contribute any share in making such laws; and though they may make representations against them, they have no power to prevent or suspend their operation. The kingdom of Lombardy is ruled by a viceroy, who resides at Milan, and enjoys a salary of about L.40,000 yearly. Under him are the governors of the two divisions into which the kingdom is formed, viz. Milan and Venice.

The revenue of the kingdom is derived in part from national domains and royalties, part of which once belonged to the church, a heavy tax upon tobacco, with some other direct and indirect taxes. The gross sum extracted is about L.2,000,000; but the collection is expensive, and the interest of the local debt is paid off it, so that not one fifth of that amount reaches the imperial treasury. There are also local taxes, which are collected and dispensed by the municipal authorities of the cities and towns. By some recent laws, all taxation on commodities passing from this kingdom into the other Austrian dominions have been abolished, and commerce between them is free. A military board has the direction of the army, and of the several fortresses, with their stores and garrisons. Six regiments of infantry and two of cavalry are recruited in this part of the empire.

The chief or head of the ecclesiastical body is the patriarch of Venice, under whom are the archbishops of Milan and Udine, with seventeen suffragan bishops. The institutions for education are, the universities of Pavia and of Padua, medical and surgical colleges at Milan, lyceums at Bergamo, Brescia, Como, Cremona, Mantua, Vicenza, Treviso, and Udine. The promotion of the higher branches of science is achieved by learned societies in most of the cities, the most eminent of which are those of Milan, Venice, Padua, and Verona.

The naval force of Austria is constructed and equipped in this kingdom. It consists of eight ships of the line of seventy-six guns each, seven frigates of forty-four guns, one corvette, eight brigs, and six schooners, mounting together 1064 cannon. Besides, there are several vessels on the stocks, but their building proceeds in a dilatory manner. Most of them are at Venice, but some are stationed at Trieste, Cattaro, and Zara. The commissioners who regulate naval affairs meet at Venice. There is a corps of naval engineers, and a battalion of infantry who serve as marines. (G.)

LOMBES, an arrondissement of the department of the Gers, in France, extending over 343 square miles. It comprehends four cantons, divided into ninety-nine communes, and contains 39,700 inhabitants. The capital, of the same name, is situated on a fertile plain, through which the river Save runs, and contains 300 houses, with 1590 inhabitants. Long. 0. 49. E. Lat. 43. 28. N.

LOMONOZOF, a Russian poet, and a great improver of his native tongue, was the son of a dealer in fish at Kolmogori. He was born in 1711, and was fortunately taught to read; a rare circumstance at that time for a person of his condition in Russia. His natural genius for poetry was first kindled by the perusal of the Song of Solomon, translated into verse by Polotski, whose rude compositions, perhaps scarcely superior to our version of the psalms by Sternhold and Hopkins, inspired him with such an irresistible passion for the muses, that he fled from his father, who was desirous of compelling him to marry, and took refuge in the Kaikonospaski monastery at Moscow, where he had an opportunity of indulging his taste for letters, and of studying the Greek and Roman languages. In this seminary he made so considerable progress in polite literature, that he was noticed and employed by the Imperial Academy of Sciences. In 1736, he was sent, at the expense of that society, to the university of Marpurg, in Hesse-Cassel, where he became a scholar of the celebrated Christian Wolf, under whom he studied universal grammar, rhetoric, and philosophy. He continued at Marpurg four years, during which time he applied himself with indefatigable diligence to the study of chemistry, which he afterwards pursued with still greater success, under Henckel, at Freyberg, in Saxony. In 1741 he returned to Russia; in 1742 he was chosen adjunct to the Imperial Academy; and, in the ensuing year, he was elected a member of that society, and professor of chemistry. In 1760, he was appointed inspector of the seminary then annexed to the academy; in 1764 he was gratified by the empress with the title of counsellor of state; and he died on the 4th of April that year, in the fifty-fourth year of his age. Lomonozof excelled in various kinds of composition; but his reputation is chiefly derived from his poetical compositions, the finest of which are his odes. His poetical and miscellaneous pieces appeared in three volumes; and he also published two small works relative to the history of his own country. The first, styled Annals of the Russian Sovereigns, is a short chronology of the Russian monarchs; and the second is, the Ancient History of Russia, from the Origin of that Nation to the Death of the Great Duke Yaroslaf I. in 1054.

LONDON.

This city, the metropolis of the British empire, is situated on both banks of the Thames, if the name be taken collectively, and in that sense, though chiefly within the county of Middlesex, includes a part of Surrey, and, for purposes of criminal judicature (by the act of William IV, called the Central Criminal Court Act), a portion of the counties of Essex and Kent.

Like most cities, the early history of this is lost in the obscurity of remote ages. The first notice of its existence to which implicit credit can be given is that in the Annals of Tacitus (lib. iv), who says, "Londinum cognomento quidem coloniæ non insigne, sed copiâ negotiatorum et commeatuum maxime celebre." The derivation of the name of this city has been variously traced, and though it must remain a matter of doubt, we state that which seems the most probable.

Llin in the Celtic or ancient British language signified a lake, and *din* a town or a harbour for ships. As until recent dates the Surrey side of the river was often a lake in some parts, and a swamp in others, the name might be easily changed from Llindin to London, and be descriptive of its local position. It could not, however be a place of very great importance at the time of the invasion of England by Julius Cæsar, for though that commander must have passed near it, he has not noticed it in his Commentaries.

The Romans, who appear to have taken possession of this city under the Emperor Claudius, about 100 years after the invasion of Cæsar, gave to it the name of Augustus in honour of that prince. Under the Roman government it was erected into a praefecture, and the inhabitants, though the name of citizens of Rome was conferred upon them, were not allowed to be governed by their own laws, but by military magistrates sent annually from Rome. It must then have acquired some degree of importance, because, in several of the *itinera* of Antoninus, the roads are described by him as beginning or ending at this place. The doubts respecting the author of the *itinera*, and the time when they were drawn up, make this inference of less authority.

It seems certain that, under the Romans, London was not fortified at an early period of their occupation; for when the Britons revolted against the Romans, and were led by their Queen Boadicea, she captured the city and burned it, after a general massacre of the inhabitants. It continued still without fortifications, till, according to Woodward, the reign of Constantine, or, according to Maitland, till the governorship of Theodosius, in the year 369. The great number of coins of Helena, the mother of the Emperor Constantine, which have been found under the walls, give the greatest degree of probability to the opinion of the former of these authors. It was certainly erected into an episcopal city by that emperor after he had been converted to the Christian religion; and that increases the probability of the opinion that he constructed the walls, for all the sees of bishops were originally within fortified places.

Whatever may have been the date of the erection of the walls, the limits to which they then extended may now be ascertained by the concurrent testimony of all the antiquarians, and by the ruins of the foundations and of parts of the wall which have been traced out within very recent periods.

A fort on the site now occupied by the Tower of London, formed the commencement of the defences. A wall was extended from it through the Minories to Aldgate, whence it proceeded between Bevis Marks, Cammomile Street, and Houndsditch, across the churchyard of Bishopsgate to Cripplegate. It then took a southerly course to Aldersgate, from which it run south-west by the back of Christ's Hospital and Old Newgate, and passing behind the present prison of Newgate and Stationers' Court, reached Ludgate. From that gate it proceeded westerly by Cock Court to the river Fleet, now New Bridge Street, and terminated at a fort called afterwards Barnard's Castle. It was also then covered by another wall along the bank of the Thames, which, however, was destroyed at a very remote period. The extent of the wall, exclusive of that by the side of the river, was two miles and one furlong; that on the bank one mile and a tenth. The height of the walls was twenty-two feet, and they were defended by fifteen lofty towers. Through some of these were the great roads leading to the different parts of the kingdom. The praetorian way, or the Watling Street, passed under Newgate, and then turned towards the river, where was a ferry connected with the road to Dover. The Hermin Street road passed under Cripplegate. Another passed through Aldgate and proceeded by Bethnal Green to the old ford over the river Lea, and on towards Essex, Suffolk, and Norfolk. In process of time other roads were laid out, when the gates corresponding to them were erected and received the names of Bridgegate, Ludgate, Aldersgate, Moorgate, Bishopsgate, and the Postern on Tower-hill.

It is probable that, after the Romans had been induced to withdraw their forces from England, and left it exposed to the ravages of the northern tribes of Picts and Scotch, London was not much improved or extended. When the Saxons had fixed themselves in the country, and assumed something approaching to a regular government, the city, which had suffered severely during the contests between the Britons and the invaders, soon recovered its former rank, and acquired new importance; so that at that period the Venerable Bede writes of it as a princely town of trade under the rule of a chief magistrate, whose title of portgrave or portreeve conveys the idea that its commerce by water must have been for the time so great as to require magisterial superintendence.

During those civil wars which the new Saxon masters of England carried on against each other till the several kingdoms were united under one head in the person of Egbert, in 819, the city of London, if it did not maintain a neutrality, seems to have sufficiently increased in importance to induce that prince to make it the capital of his whole kingdom; which it has continued to be ever since that reign.

Soon after this the Danes began their nautical predatory excursions, and at length, after attacking the northern ports of the kingdom, in 849 entered the Thames with 250 vessels, seized upon London, plundered and then burned it, and exercised their savage cruelties on the inhabitants. A second attempt by some piratical people was made, and with greater force, about two years after; but on this occasion, King Ethelwolf and his son Athelbald collected a sufficient force to disappoint and finally to overcome the invaders, though the returning prosperity of London received a severe check by the attempt.

In the reign of Alfred the Great, London soon began to recover from the ruinous condition in which the attempts of the Danish invaders had left it. He restored the ruined defences, expelled those of the Danes who had been settled there, affirmed the privileges which had been conferred, added to them others, and contributed much to ornament the whole city. Having made it a place of security by its walls, and capable of a powerful defence, it was placed under the government of his son-in-law, Ethelred duke of Mercia. In this condition it was, when, in 893, an accidental fire bursting forth spread with unextinguishable fury, and the houses being wholly constructed of wood, became at length a prey to the flames. As the walls were uninjured by the conflagration, the security they afforded encouraged the government and the inhabitants to restore their losses with great expedition. The city was first divided into wards, and magistrates were appointed to each, who then bore the name of sheriffs, a title which had been first created for those who exercised the authority of the monarch in the several districts into which he had divided the whole kingdom. In the portreeve and those sheriffs are to be found the first traces of that system which, with some variations, has continued to regulate the affairs of the city to the present time. As soon as Alfred had settled the general state of his dominions into moderate tranquillity, his attention was drawn to the capital, and the spirit he inspired was speedily exhibited in London. The new houses were constructed with more solidity, and with greater skill and ornament. The chief material used in the buildings was still wood, but some of the nobility were induced by the king to erect houses within the walls of the capital in which stone or bricks were used, and a few of the more wealthy citizens followed the example thus shewn to them; but still the number of such buildings was small in proportion to the whole. At that time thatch was the universal covering.

England had rested from the ravages of the Danes more than a century, when, in 1013, the King of Denmark, Swend, called by English writers Sweyne, or Sweno, aided by Olaf Tryggvason, King of Norway, undertook the subjugation of the whole kingdom. The Danish monarch landed in the Humber with a powerful and splendid armament; and leaving his fleet there under the command of his son Kund or Canute, marched his forces into Wessex, which he laid waste and subdued. Ethelred then abandoned his palace and capital, and sought refuge in the Isle of Wight. The burgesses of London opened their gates to the invader, who was acknowledged as their king by the Anglo-Saxons; and Ethelred, who had married Emma, daughter of the Duke of Normandy, repaired for safety to that country.

Although war was still carried on in the kingdom by the Danes under Canute, who had succeeded to the power of his father, and by the Anglo-Saxons under the Prince Edmund Ironside, the result was so doubtful, that a compromise was entered into by the two commanders, by which Canute secured his power over the city of London, and was acknowledged and received there as the lawful sovereign. Canute, then, as master of the whole kingdom, imposed upon his subjects a tax to pay his army, amounting to L. 72,000, of which L. 10,500 was to be paid by London. As far as the combined wealth and the population can be measured by the amount of taxation, London might then be considered as constituting one-seventh part of the whole kingdom, and this is nearly the proportion which it has borne from that time to the present day.

On settling the succession to the crown, after the death of Canute in 1046, the English supported the son of King Ethelred, or, on default of him, Hardicanute, a son of Canute, by Queen Emma; whilst the citizens of London espoused the claims of Harold Harefoot, a son of Canute by the Queen. Edward's party speedily declined, and the two half brothers remained the sole competitors. Hardicanute repaired early to England; and an assembly, or *wittenagemote*, was convened at Oxford, consisting of all the nobles to the north of the Thames, at which Harold was raised to the throne. At this assembly, where nobles only were admitted, the pilots of London, comprehending probably those who were the chief merchants, also held a meeting, and no important affairs were resolved upon without their consent. Some have represented this as the first instance of London having sent members to a legislature; whereas it seems to have been more like an aristocratic assembly, to which chartered citizens, forming a kind of commercial nobility, were admitted.

After the defeat of the Saxons, at the battle of Hastings, the city of London tendered a ready submission to William the Norman, who confirmed to them the privileges which former monarchs had bestowed, and granted additional power by two new charters. The city was tranquil and prosperous; but it received a severe check by a fire, which consumed a great part of the houses in 1077; and by another, nine years afterwards, when the new buildings, as well as the old, were consumed together. The fire of 1086, which began near Ludgate, burned the cathedral of St Paul's, which, however, was soon rebuilt, with more than its former magnificence.

During the reign of the second William, the prosperity of the city was in some measure checked by the exactions he enforced, but in a greater degree by several fires, some violent hurricanes, and extensive inundations. Henry, who succeeded, granted several immunities to the city, which tended to increase its commerce; and he especially restrained the rapacity of the Norman barons, and prohibited within the walls the insolent conduct which they had practised to an enormous excess. The city continued to flourish under Stephen, and his turbulent reign; though, for his own warlike purposes, he exacted large sums of money. The prosperity of the city seems to have begotten internal disorders. Many confederacies were formed, in which some of the rich citizens engaged, to commit robberies, and even murders, in the night time. For these the inhabitants were made to pay a fine of five thousand pounds, and one of the conspirators, a rich man of the name of Senex, was hanged, though an offer of five hundred pounds weight of silver was made to save him from the gallows.

Henry II. changed the title of portreeve for that of bailiff; and that officer claimed, as a matter of right, the performance of the duty of butler at the subsequent coronation of Richard I. In 1191, the bailiff assumed, or was granted, the title of mayor; and the following year Henry Fitz-Alwene, who then filled the office, issued orders in his own name, jointly with that of the aldermen, for the prevention of fires. By this document it was commanded that "all houses to be erected in London hereafter, whether in the city or in the liberties thereof, should be built of stone, with party walls of the same; and should be covered either with slates or tiles, to prevent those dreadful calamities which were frequently and chiefly occasioned by houses built with wood, and thatched with straw or reeds." For this purpose it was also provided by the more discreet men of the city, that "twelve aldermen of the city should be chosen in full hustings, and there sworn to assist the mayor in appeasing contentions that might arise among neighbours in the city, upon inclosure betwixt land and land, and to regulate the dimensions of party walls, which were to be of stone sixteen feet high and three feet thick; and to give directions about girders, windows, gutters, and walls." In 1198, Richard, who placed confidence in the wisdom and fidelity of the city of London, when resolved to fix a standard of weights and measures for the whole kingdom, committed to the sheriffs of London and Middlesex the execution of his plan; and they were charged to provide measures, gallows, iron rods and weights for standards, which were to be sent to every part of the kingdom.

King John, who succeeded Richard, conferred additional favours on the city of London, by several charters which were granted in his reign. He first confirmed former grants, and conferred on the citizens the privilege of entering his foreign dominions free from all tolls and taxes; a matter of considerable advantage in the commerce with

Normandy, whence wine was imported, and to which English wool was exported. This was, however, an affair of bargain, as the king was paid for the privilege one thousand pounds weight of silver. By another charter the citizens of London had conferred on them the jurisdiction and conservation of the river Thames, and an additional grant of the same right over the river Medway. A third charter conveyed to the citizens the power of choosing their sheriffs, who had before been nominated by the crown, and also invested them with the right of shrievalty over the county of Middlesex, and valuable fee-farm rents, of which they had been deprived under a former reign.

Henry III. made several attempts to encroach upon those privileges which his predecessors had conferred upon London; and this conduct was productive of many serious disturbances both in London and in Westminster. They were suppressed by violent and arbitrary measures, and at length the whole nation was in a state of alarm, when the parliament interposed, and induced the king to redress, or promise to redress, the most severe of the grievances that were the subject of complaint; but, with respect to the city, the charters were renewed, and the rights and privileges of the citizens confirmed. At this time the right of using a common seal was granted. The king, however, during his whole reign, continued to exact money from the city.

During that long reign of fifty-six years, though the city was sorely afflicted with two years of famine, first in 1258, when, according to Fleetwood, many people were starved, and again, in 1270, when, according to the same authority, "provisions were so scarce, that parents did eat their own children," and wheat was sold at a price, equivalent in our money to thirty-six shillings the bushel; London on the whole continued to increase, but was disgraced, if not retarded, in the progress of its foreign commerce, by the cruelties and plunderings which were exercised towards the Jews who had settled there.

In the reign of Edward I. the city was first divided into twenty-four wards, each of which was then allowed to choose common councilmen and an alderman. Under Edward III. the city received some additions to its authority, the most eminent of which was the perpetual right of magisterial supremacy over the borough of Southwark. An epidemic disease, or kind of plague, proved a calamitous visitation to London. It first became apparent in 1348, and was said to have been imported from the East. Its ravages were so extensive, that it is related in the chronicles of the time that more than 50,000 persons became its victims; and it did not altogether disappear till it had been nine years the source of grief and anxiety.

In the year 1380 the insurrection of Wat Tyler alarmed the city, but was soon suppressed without much difficulty. It is stated to have been put down by the zeal of Sir William Walworth, the lord-mayor, who stabbed the leader of the *jaquerie* in Smithfield. In commemoration of this event the dagger was added to the arms of the city.

The first illuminations in the city took place at the coronation of Henry IV., and, after the victories of Henry V. in France, they were again repeated; from which time London began to be lighted at night by lanthorns.

The latter part of the reign of Henry VI. was disturbed by insurrections in several parts of the kingdom; the chief of which, as affected London, was that in Kent under the guidance of John or Jack Cade. He collected a body of 20,000 men, and having obtained some slight success over the Sheriff near Sevenoaks, he advanced to London, which opened its gates to admit him, whilst the king fled to Kenilworth. At first some order was preserved by Cade; but he found himself unable to repress the riotous disposition of his followers. All became confusion among them; and the leader being killed, and several of his followers executed, the suppression of the revolt was the speedy consequence. This event occurred in 1450, and it was soon followed by the wars between the houses of York and Lancaster. In this contest, the city of London chiefly favoured the interests of the latter family; and, after the battle of Barnet, Edward IV. bestowed the honour of knighthood on the mayor, the recorder, and twelve of the aldermen. In this reign occurs the first notice to be found of bricks being used for building London. They were burned in Moorfields. It was also the era in which the first printing-press was constructed and worked by Caxton; and about the same time, the cisterns and conduits for supplying water, in several parts of the city and suburbs, were erected.

In the reign of Henry VII. a nondescript disease, called the sweating sickness, generally prevailed in England, but especially in London, where it appears that two mayors and six aldermen, with numerous other citizens, fell victims to this disease. Notwithstanding the very extensive spoliations committed on the city by the king and his favourites, Empson and Dudley, some considerable improvements were made. The chapel at Westminster, bearing that monarch's name, was commenced; the river Fleet was rendered navigable to Holborn Bridge; and an artillery-ground for the practice of archery was established.

In the reign of Henry VIII. the city successfully resisted the attempts of that monarch to extort money without the authority of Parliament. Many improvements were made, to which the suppression of several of the religious houses contributed; nor were these much impeded by the religious persecutions sometimes directed against Catholics, and at others against Protestants.

In the short reign of his son Edward, London was permanently benefited by the establishment of the great hospitals of Christ's, of Bridewell, and of St Thomas's.

Owing to the wise conduct of Elizabeth and her ministers, the prosperity of London advanced during the whole of her reign. The great number of intelligent and wealthy persons who took refuge there from the cruel wars carried on in the Netherlands, and who were protected by the government, generated a spirit of industry and order amongst all classes; and they introduced numerous manufactures before unknown in England, which conferred benefits upon the whole kingdom, and especially upon London, which was the chief point from which the trade was carried on. She, as well as her successor James, was averse to the great increase that was going on in houses and inhabitants in London, and both issued unavailing proclamations to prevent its growth. As abundant materials of that period are now extant, it may not be uninteresting to sketch from them a short description of the extent of metropolis which created serious uneasiness to the government of that time, and to enable the reader to contrast the state of the city at that period, with the appearance which it now exhibits.

Extent of the city.

By some apparently correct maps of the reign of James I. it may be seen that the chief part of London was along Newgate Street, Cheapside, the Poultry and Cornhill, and the various streets and alleys leading from them to the banks of the Thames. Except in Coleman Street and a few scattered houses in Lothbury and Bishopsgate, all the way lower down was garden-ground or fields. There was an irregular street from Bishopsgate to Shoreditch Church, with open fields behind the houses; and Houndsditch was a single row of houses, looking on the city walls, with open fields behind them. What is now Goswell Street was then called the St Alban's Road, with a few houses. Clerkenwell consisted chiefly of the monastery, the gardens, and buildings which had belonged to the church; and thence to Gray's-inn-lane was open field, with a few gardens. From Holborn Bridge to Red Lion Street there were houses on both sides; but they ceased there; and the road to the small village of St Giles's had hedges on both sides, and still

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has the addition, "in-the-fields," to its name. To the northward and westward of this spot, all was open field, excepting on the road to Oxford, on both sides of which were hedges and a few trees. Tyburn was then a hamlet two miles from London. A road proceeded from the road to Oxford, and joined that leading to Reading, opposite to what had been the hospital, but subsequently the palace, of St James's. There were a few houses near St Martin's Church, in the way to the garden of the convent; but Leicester Square, Long Acre, Seven Dials, and Drury Lane were open fields.

Along the Strand were houses on both sides, but those to the south were chiefly palaces of the nobility, with gardens behind them extending to the river. These were in the occupation of the peers, whose names have been given to the streets which have been built on their stately mansions, viz. Northumberland, Salisbury, Arundel, Cecil, Norfolk, Surrey, Villiers, Buckingham, and Essex. Each of the noble owners kept barges, with watermen in splendid liveries, to convey them either to the city or to the court at Whitehall, or to visit at Lambeth or Chelsea.

Spring-gardens were a series of walks extending to the palace of Whitehall, whence to the Abbey there was a regular street, and a few beyond, facing the water, near the spot on which Abingdon Street has since been built.

On the Surrey side, there were not ten houses between Lambeth and where now is the west foot of Blackfriars' Bridge; but from that point a row of houses was continued to the borough. Where Christchurch now stands, was a theatre of some kind, called Paris Gardens. It is said that Ben Jonson was an actor on these boards. It seems to have been most frequented on Sunday, and to this profanation its fate has been attributed. Being filled with spectators in 1582, the scaffolding fell, when a number of persons were killed and many much injured. Below this was a large circular building for bear and bull baiting, which attracted great crowds, and where it has been said Queen Elizabeth frequently attended the spectacle. Southwark then extended but a short distance along the High Street, and there were small scattered houses from Tooley Street to Horsely-down.

During the reign of James, the streets were first paved with stones. The city was, however, visited by the plague in 1604, by which many of its inhabitants were carried off.

In the commencement of the reign of Charles I., the metropolis was once more visited by the plague; and though it was not of long duration, the deaths occasioned by it were estimated to amount to near 40,000 persons. In the civil wars of that unfortunate period, a majority of the corporation of London, and most of the lower class of citizens, took the side of the House of Commons; and the treasury of the city was found of great service to the party they espoused. As long as the king maintained an army, it was remarked by the writers of the day that no building in the city was carried on; but, after the battle of Leicester, the progress of erecting new houses proceeded as before.

Plague and great fire.

After the restoration of the monarchy, London began greatly to revive; but a serious check was given to its advancement, first by that dreadful visitation the plague, which first appeared in December 1664, and continued till January 1666. The greatest number of deaths were between May and October 1665, when the victims of this disease increased from 500 to 8000 in a week. The effect of this visitation, during its continuance, was to suspend all trade, to close the exchange and the courts of law, and to leave the houses, which had been rendered vacant by the demise of the occupiers, a prey to bands of thoughtless and desperate plunderers. The total number of deaths occasioned by this calamity has been estimated at 100,000, or nearly one-third of the whole population.

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A short period only intervened between this calamitous visitation and another, which seemed to be a dispensation of Providence, to cure one evil by another. On the 2d of September 1666, a fire broke out in a lane near London Bridge, then as now called Pudding Lane. It was on a Sunday, when the people were repairing to the churches. It spread with wonderful rapidity, being increased by a very high wind; and it is remarked by Vincent, that during the progress of the fire, the wind frequently changed its direction, so as to convey the inflammatory matter to parts in which, a few minutes before, no apprehension of danger had been entertained. The houses were mostly of wood, and much crowded together; water was scarce, and the atmosphere dry. In every direction the fire spread; and Evelyn, one of the most observant spectators, compares the whole spectacle to a sea of fire. It raged four days and nights, and in that time five-sixths of the whole city within the walls were reduced to ashes. In the destruction, the halls of the companies, the churches, and other public buildings, though of less inflammable substances than the dwellings, fell alike a sacrifice to the devouring element. At length the blowing up of some houses by gunpowder, depriving the fire of materials to feed upon, the progress was stopped near to St Bartholomew's Hospital, at a place called Pye Corner. The ruins covered a space upwards of a mile in length, and half a mile in breadth. It would have been difficult at that day, and is much more so at the present time, to estimate the pecuniary loss suffered by this visitation. It was calculated by some, but the grounds of the calculation are unknown, that the value of buildings and goods consumed amounted to ten or twelve millions sterling. A spirit of wisdom and generosity seemed to have been created by the magnitude of the suffering; and the government, as well as individuals, made wonderful exertions to administer relief. The tents in the Tower, and the sails from the shipping, were converted into temporary coverings for sheds to accommodate the inhabitants. The roads were almost choked with horses and waggons loaded with necessaries, and the boats and barges upon the river were occupied in the same employment. Measures were immediately adopted to rebuild the city, and a commission was appointed, of which Sir Christopher Wren was the most active member, for adjusting the boundaries of the property that had been covered with ashes, and for regulating the new streets that were to be built. Attention was not only directed to immediate necessities, but extended to other objects; such as rebuilding the public edifices which had been burned, of which St Paul's Cathedral was one.

By what means the number of labourers were collected, or from what funds the money to pay their wages was obtained, has been often the subject of very unsatisfactory inquiry; but it is certain that the city was rebuilt with a degree of rapidity which excited the astonishment of the age that witnessed it. The work was well conducted; for the greater part of the public and private buildings which now exist were erected at that period, and are still firm and strong after the lapse of 170 years. The city rose in about four years, more commodious than before; and, however the fact may be accounted for, since that period, it has never been visited by that tremendous disease the plague, whose recurrence before had been so frequent and so extensively fatal.

Reconstruction and growth of London.

From the time of this reconstruction, few events are to be noticed that affect London peculiarly. Almost all important occurrences belong rather to the history of England than to that of its metropolis. The revocation of the edict of Nantes in France brought to London many French Protestant families, who introduced the manufactory of silk, and peopled Spitalfields, and of others, who being ornamental jewellers and goldsmiths, were first established in Long Acre, Seven Dials, and Soho.

The continued growth of London in the reign of Queen Anne, induced the passing of a law in 1711 for constructing fifty new churches, for which a provision was made by a tax on all coals brought into the river Thames. The streets were first generally lighted at night. The several parishes were provided with fire-engines and buckets, and measures were instituted for watching the city. In the same reign, Clerkenwell, Old Street, the lower part of Shoreditch, Marlborough Street, Soho, Bedford Row, Red Lion Square, and a district north of Holborn, were added to the city.

In the reign of George I. some, but not great, additions were made to London, chiefly to the north of Oxford Street, about Marylebone, and Berkeley Square.

Although the increase of London proceeded, it was at a languid pace, compared with what has been more recently exhibited, throughout the whole reign of George II. New parishes were erected, viz. St George's, Bloomsbury; St Ann's, Limehouse; St Paul's, Deptford; and St Mathew's, Bethnal Green. The river Fleet was covered with an arch, and a market built upon it; Grosvenor Square was built, and also Westminster Bridge, with its appendage Great George Street. Roads were also formed in several directions, the chief of which was that from Paddington to Islington, surrounding the northern part of the city.

The accession of George III. was followed by the peace of Paris in the year 1763, and that event gave a fresh stimulus to improvement and extension. A new bridge was built at Blackfriars, with handsome streets leading to it, and a great number of new dwellings were erected on the Surrey side of the river. On the north-west side the parishes of Pancras and Marylebone were formed. It was at the same period that the excellent pavement forming the footpath for passengers was first laid down, and the kennels removed from the middle of the streets to the two sides of them. Most of the houses had large signs suspended across the street, which darkened them, and prevented the circulation of air. These were removed by law, and as they were used for distinguishing the several houses, the practice of fixing a number to each house was introduced. About the same time the names of the streets, lanes, and squares were ordered to be marked at each corner. During the early part of that reign, the complaints of the Spitalfields weavers, and the agitation created by Wilkes, with the war with America that succeeded these grumbling times, seem to have given a temporary check to extension, as only Somerset House and Manchester Square, with some parochial chapels in Marylebone, date their commencement in that series of years. The disgraceful riots of the year 1780, when, for a few days, a contemptible mob destroyed the prisons and several other buildings, may also have had a tendency to impede improvements, which continued to proceed with slow steps, even after the peace of 1783, till the accession of Mr Pitt to a firm seat at the head of the Ministry. Whether that minister was the cause of the improvements which followed, is not a question to be discussed here, but from this period the advance became more rapid, and has never slackened from that to the present day; but, on the contrary, has been constantly proceeding with accelerated force. The advance had its chief source in the power communicated by the rise of the funds in a short period from fifty to eighty-five; which supplied a spare capital for the construction of docks, by which the commerce of the city was rapidly augmented, and the ground near the water side covered with numerous and convenient structures.

The trade which enriched the eastern part of the metropolis extended its influence, and displayed its effects, in the western parts. Bedford Square, Russell Square, Brunswick Square, and the well-built streets contiguous to them, have their origin at the period we refer to, and became the habitations of persons, who, by property acquired in commerce, were enabled to spend the latter portion of each day in more elegant quarters than the city offered; though, at that time, the handsome square of Finsbury had been formed, with many good streets in its vicinity.

The accession of George IV. to the regency in 1812, followed by those glorious victories which led to peace two years afterwards, must be viewed as an era from which to date the commencement of that rapid advance in extent, in elegance of design, and in excellence of workmanship which London now displays, and which is rapidly proceeding.

Population.

In the description of this vast city the first object is the population, its numbers, and gradual augmentation. Like the rest of England, the number of inhabitants in London was a subject of controversy, till the first census of the whole kingdom taken in the year 1801, was produced to the public by the indefatigable and accurate labours of Mr Rickman, under the sanction of an act of Parliament. As the facts ascertained by him at that period have been confirmed by the three subsequent decennial census of 1811, 1821, and 1831, no doubt can be entertained of their complete accuracy.

Mr Rickman in a kind of summary of population in the limits he assumes, and very properly, as those of the metropolis, makes it in the year 1700 to have been 674,000, in the year 1801 to amount to 1,031,500, in 1811 to 1,220,200, in 1821 to 1,481,500, and in 1831 to 1,776,556. As by the successive enumerations, it is clear that the inhabitants have gone on increasing at the rate of twenty per cent. in ten years (and there is no reason to suppose it has proceeded at a slower rate in the last four years), we may add eight per cent. to the population of 1831, and assume that at the present time (April 1835), it amounts to 1,918,680.

The limits to which this enumeration refers, is to all those parishes the churches of which are situated within eight English miles in a straight line from St Paul's, adding a twenty-fifth part in each instance as a moderate allowance for the great number of British seamen belonging to the registered shipping at anchor in the Thames, for soldiers quartered in the Tower and in other barracks, or for the transitory population continually arriving and departing so irregularly as to escape all enumeration.

In giving the population of the metropolis, we shall state that of the *city within the walls* in a condensed form, not enumerating each parish, of which some have not 100 inhabitants; but in the *city without the walls*, where the parishes are more populous, in Westminster, and in the out-parishes, we shall name each, with their population at every decennial census.

The city within the walls contains 97 parishes, with a church to each; and the population amounted, in 1801, to 75,377; in 1821, 56,174; in 1831, to 55,778.

The following are the parishes without the walls.

	1801.	1811.	1821.	1831.
St Andrew's, Holborn, with Barnard's Inn,	5,548	5,741	6,234	5,570
St Bartholomew the Great,	2,645	2,769	2,931	2,923
St Bartholomew the Less,	951	843	823	863
St Botolph without Aldersgate,	4,161	4,135	4,003	3,994
St Botolph, Aldgate,	8,686	8,297	9,067	9,615
St Botolph without Bishopsgate,	10,314	9,184	10,140	10,025
St Bride's or Bridget's,	7,078	7,003	7,288	6,860
Bridewell Hospital, with extra parochial precinct,	453	459	444	360
St Dunstan in the West,	3,021	3,239	3,549	3,443
St Giles' without Cripplegate,	11,446	11,704	13,038	13,134
St Sepulchre without Newgate,	8,092	8,724	8,271	7,710
Trinity in the Minories,	644	602	680	508
White Friars' precinct,	783	926	1,247	1,302
	64,486	64,228	68,395	66,815

City of Westminster, in ten parishes.

	1801.	1811.	1821.	1831.
St Anne, Soho,	11,637	12,288	15,215	15,600
St Clement's Danes,	8,717	9,796	10,753	11,578
St George's, Hanover Square,	38,440	41,687	46,384	58,209
St James's,	34,462	34,093	33,819	37,053
St John's,	8,375	10,615	16,835	22,648
St Margaret's,	17,508	18,680	22,387	25,314
St Martin's in the Fields,	25,752	26,585	28,252	23,970
St Mary le Strand,	1,704	1,578	1,784	2,052
Duchy Lancaster,	474	443	489	410
St Paul's, Covent-Garden,	4,922	5,304	5,834	5,203
Close of the Collegiate Church of St Peter,		175	181	185
Savoy precinct St John Baptist,	320	287	222	431
Verge of the palaces of St James's and of Whitehall,	1,685	182	641	238
	153,996	161,713	182,796	202,891

Parishes in Southwark, described by the bills of mortality as parts of the city without the walls.

	1801.	1811.	1821.	1831.
St George's,	22,293	27,967	36,368	39,769
St John's,	8,892	8,370	9,163	9,871
St Olave,	7,846	7,917	8,420	8,694
St Saviour's,	15,596	15,349	16,808	18,006
St Thomas's,	2,078	1,586	1,807	1,456
	56,705	61,189	72,566	77,796

Parishes described in the bills of mortality as " Out parishes in Middlesex and Surrey."

	1801.	1811.	1821.	1831.
Christchurch, Surrey,	9,933	11,050	13,339	13,705
Christchurch, Spitalfields,	15,091	16,200	18,650	17,949
St Dunstan's at Stepney,	25,260	35,199	49,163	67,872
St George's in Bloomsbury, united with St Giles' in the Fields,	36,502	48,536	51,793	52,907
St George's in the East	21,170	26,917	32,528	38,505
Carry over,	107,956	137,902	165,473	190,938

	1801.	1811.	1821.	1831.
Brought forward,	107,956	137,902	165,473	190,938
St George's by Queen Square,				
St Giles' in the Fields,				
St James's, Clerkenwell,	23,396	30,537	39,105	47,634
St John's, Clerkenwell,				
St John's, Hackney,	12,730	16,771	22,494	31,047
St John's, Wapping,	5,889	3,313	3,078	3,564
St Katherine's, Tower,	2,652	2,706	2,624	72
St Leonard's, Shoreditch,	34,766	43,930	52,966	68,564
St Luke's, Middlesex,	26,881	32,545	40,876	46,642
St Mary's, Islington,	10,212	15,065	22,417	37,316
St Mary's, Lambeth,	27,939	41,644	57,638	87,856
St Mary's, Bermondsey,	17,169	19,530	25,635	29,741
St Mary's, Newington,	14,847	23,853	33,047	44,526
St Mary's, Rotherhithe,	10,296	12,114	12,523	12,875
St Mary's, Whitechapel,	23,666	27,587	29,407	30,733
St Paul's, Shadwell,	8,828	9,855	9,557	9,544
	337,227	417,352	516,440	641,052

The following parishes are in contact with the metropolis, and are necessarily the portions in which its greatest extension has of late years been made, and in which the future greatest increase of houses and inhabitants must also take place.

	1801.	1811.	1821.	1831.
Chelsea,	11,604	18,262	26,860	32,371
Kensington,	8,556	10,886	14,428	20,902
Marylebone,	63,982	75,624	96,040	122,206
Paddington,	1,881	4,609	6,476	14,540
Pancras,	31,779	46,333	71,838	103,548
	117,802	155,714	215,642	293,567

Besides the portions formerly called London, the extension of its limits upon every side has caused junctions between the metropolis and many large villages, which are now scarcely to be distinguished from, and in fact form suburbs to it, and rapidly increase with it. They are now as much a part of London as Paddington or Marylebone, because the people who inhabit the houses have their chief occupations in the metropolis, and are thence supplied with most of the necessaries they consume. The calculation before noticed was made by Mr Rickman, to shew the contrast between the population of London and that of Paris, and comprehended a circle of eight miles around St Paul's; but since the publication of his reports, the law of 1834 has extended the criminal circuit of London somewhat farther, and included in it not only the villages in Middlesex whose prisoners were always tried at the Sessions at the Old Bailey, but has brought within the limits of that court, towns and villages in Essex, Surrey, and Kent. The places forming, in this view, a part of London, besides those included in the population already stated, are these: in Middlesex, Tottenham, Edmonton, Hornsey, Highgate, Hampstead, Hayes, Hendon, Wilsden, Brentford, Acton, Cheswick, Isleworth and Fulham, with Hammersmith; in Surrey, Battersea, Bermondsey, Camberwell, Clapham, Streatham, Barnes, Putney, Tooting, Wandsworth, Merton, Mortlake, Kew, Wimbledon, and Richmond; in Kent, Eltham, Charlton, Lee, Lewesham, Greenwich, Woolwich, Plumstead, and Deptford; and in the county of Essex, Barking, East Ham, West Ham, Ilford, Low Layton, Walthamstow, Wanstead, Chingford, and Woodford.

Not to occupy too much space, the growth of the population of these places must be omitted; but the number of inhabitants at the census of 1831 is extracted, and stands thus: In the places within the county of Middlesex, as above mentioned, 70,458; in the county of Surrey, 124,185; in the county of Kent, 79,971; and in Essex, 33,769; being together 308,389.

The whole population of the metropolis in May 1831 may thus be enumerated:—

City within the walls,	55,778
City without the walls,	66,815
City of Westminster,	202,891
Borough of Southwark,	77,796
Out-parishes in the bills of mortality,	641,052
Parishes not in the bills of mortality,	293,567
Other places within the new judicial circle,	308,389
	1,646,288

As the limits here assigned to the metropolis are different from those assumed by Mr Rickman, the result of the numbers necessarily varies without any incorrectness in either representation, each of which is taken from the same ascertained facts. Mr Rickman, as has been before remarked, has very judiciously added to the number of persons, as collected from house to house in the metropolis, one twenty-fifth part for seamen, military, and temporary residents; which, considering the great number on board the ships, seems not too much. Following the same rule, and adding that proportion to the number before stated, we conclude that the sum total of the population in 1831 was 1,704,830; and, allowing for the same rate of augmentation of two per cent. per annum, similar to what has appeared by the accounts of former periods, we arrive at a conclusion approximating as nearly to accuracy as the nature of the matter will admit, that, in June 1835, the metropolis as here defined contained 1,838,490 souls.

Situation of London.

London was founded in a situation peculiarly favourable for a large city. It stands on the banks of a fresh-water river, but yet is operated upon by the tides. The natural soil is composed of gravel and clay, with slight mixtures of loam and clay, a soil easy to be made productive by addition of that animal and vegetable matter which are exuviæ of large towns. In every part there are abundant springs of pure water. The valley of the Thames has an immediate gradual ascent on the north side; and on the south side the range of hills is not more than two miles distant, and the intervening flat land has by embankments been well secured against inundations. The air is temperate and rather dry than moist, and the health of the inhabitants has gradually but rapidly improved from the beginning of the last century, when the deaths were annually one in twenty of the whole population, whereas at present they are about one in forty.

Thames.

The existence, the growth, and the prosperity of London have all been so indebted to its situation on the river Thames, that any description of that city would be imperfect which did not dedicate a portion of it to what relates to that noble stream.

The source of the Thames is just within the borders of Gloucestershire, a little to the south-west of Cirencester; and after crossing a small angle of Wiltshire, it again enters that county, and proceeds to Lechlade. At that place it is brought into connexion with the river Severn by means of a navigable canal, which passes through a tunnel under the park of Lord Bathurst, and then proceeds by Stroud to the river which passes Shrewsbury, Worcester, Gloucester, and Bristol. This was the first communication which was formed between the two greatest of the English rivers. Bold and public spirited as this attempt was, those who have expended their money and their attention on it have reason to regret the inadequate compensation which they have received or are likely to receive.

The Thames becomes first navigable at Lechlade, and by means of locks carries long barges of about seventy tons burden; but the navigation is long and expensive. In summer, when the water is low, it is necessary to pen it up at the locks till a sufficient body is accumulated. When they are opened, the rush carries them down till they get aground, when they must wait for the next flash, as it is locally called, to carry them forward. In winter it often happens that the water is so swollen as not to admit the barges, whose cargo is piled up high, to pass under the arches of the bridges. Though the barges descend by the current, they must be drawn upwards by horses against the stream, which is very expensive, as, after heavy rains, it is not unusual to see fifteen or sixteen horses drawing a single barge, and with the greater difficulty from the towing paths being at such times covered with water. The Thames proceeds along its rich, but in places contracted, valley, till it arrives at Oxford, where it is joined by the Isis, a short but at times copious stream, rising near Iylesbury in Buckinghamshire. From additional quantity of water the barges that navigate from Oxford to London are of a greater burden than those which are used on the more western portion of the stream.

At Reading the river Kennet empties its water into the Thames. That river is navigable upwards to Newbury, whence a canal connects it with the Avon, which passes to Bath and Bristol; and thus another line of communication is formed between the two great streams the Thames and Severn. Near Stains the river Coln adds its water to that of the now great stream. A few miles lower the Wey joins it, and by a canal from that stream to Basingstoke, a water intercourse is formed with Winchester and Southampton. At Brentford a communication by a cut is made into the Grand Junction Canal; and the Thames proceeds to London with no addition to its water except from the river Wandle on the Surrey side, and some small brooks on both sides. The effect of the tide is felt as high up as Kingston, and sometimes even at Teddington. The rise of the tide just below London Bridge is eighteen feet, by which vessels of three hundred and fifty tons drawing sixteen feet water can approach to the Custom-house. At Deptford the rise is more than twenty feet, by which the largest India ship drawing twenty-three feet water may come to that place. The river continues fresh as low as Woolwich, and even there it is only brackish at high-water in spring-tides. The river above London flows generally over a gravelly or clayey bottom, which gives growth to abundance of weeds, that afford shelter to vast multitudes of fish, and protects them for the illegal fisherman more than the care of the water-bailiff. The length of the course of the river, from the time it becomes navigable at Lechlade, till it reaches London, is 138 miles. As the corporation of the city are the conservators of the river, they appoint a navigation committee, who have the superintendence of the towing-paths, the bridges, the water-courses, and whatever relates to the river, as high as a stone marking the city boundaries a little above the bridge at Staines. Above that place the supervision is divided between the city and a body corporate, which is chiefly composed of the land-owners on both sides of the river.

The conservation of the river Thames below London is also in some measure under the government of the corporation of the city, and extends up the Medway to Rochester; but the corporation of the Elder Brethren of the Trinity House have a concurrent jurisdiction. The city has the protection of the fishery, but the soil of the river to the main sea is vested in the Trinity House, for the benefit of poor and decayed seamen, their wives, widows and orphans, and no ballast can be raised for any ship without its authority, under very heavy penalties. The appointment and control of pilots, the erection and repairing of marks on the land, the placing and keeping in order the buoys which indicate the channels, and the establishment of floating lights, are under the superintendence of the Trinity House. As there are numerous shoals in the river, and some of them often shift their position, a great deal of vigilance is required, as well as practical nautical knowledge, to perform these important duties; and the legislature has placed the shipping of the port of London under the direction of harbour-masters nominated by the corporation and approved by the Trinity House, who direct the mooring of all vessels excepting within 200 yards of the docks, which space is under the control of the dock-masters. In the river Thames, the time of the tides flowing, and the perpendicular height to which it reaches at the full and the change of the moon, are as follow: At London, at $11\frac{3}{4}$, it rises 18 feet; at Woolwich it is high water at $11\frac{1}{4}$, at Purfleet at $1\frac{3}{4}$, at Gravesend at $1\frac{1}{2}$, at Holy Haven at $12\frac{3}{4}$, at the Nore $12\frac{1}{2}$; the rise at Purfleet is 17 feet, at Holy Haven 15, and at the Nore 14; but allowance must be made for the wind, which when high greatly affects the tide.

The tide at the mouth of the Thames is thus full more than two hours before it is high water at London Bridge, and after it flows there, it rises in height upwards for half an hour, in the middle of the river, although the water may have fallen a foot in height, having an eddy current on one or both sides the stream. In like manner, it rises one foot in height before the flood appears to run up.

Navigation of the river.

Owing to the numerous, and sometimes opposite, directions which the river takes, the change of its currents according to the state of the tide, and the various shoals in many parts, the navigation is intricate and difficult, and the river-pilots are a distinct class of men from the sea-pilots; the former conducting vessels to Gravesend, and the latter taking charge of them to the Downs, or even to Portsmouth, if they are bound to that place.

Before the introduction of steam-vessels, and the application of them to the purpose of towing ships, it frequently happened to large loaded vessels ready for sea, whilst an easterly wind blew which would be favourable if they were at sea, that they could not safely descend the river to take advantage of it. It was too dangerous for such large vessels to attempt to drop down with the ebb tide, and impossible to turn to windward against the flood tide; but now steamers can take them in tow and carry them without risk to the part where they can avail themselves of the propitious breeze.

As the mouth of the Thames, like that of other great rivers, is filled with sand brought down by the constant current of the water, through which banks the water makes its way by channels of greater or less capacity, it is necessary that such channels should be clearly pointed out either by buoys or lights. At the mouth of the Thames, these indications of the channels are numerous, accurately placed, and so distinguished that each can be easily known. The buoys are chiefly to be distinguished by their colour, with due regard to their position or bearing from some object upon the land. They are securely moored, but turn with the tide. Those upon the several channels are well known to the pilots, and their enumeration here would be of no use, as no vessels attempt the passage in or out without a pilot on board. The lights are fewer, and deserve notice. At the Nore, where the Thames is about nine miles from shore to shore, one of the great channels through the sandbanks begins; a light vessel is placed in the room of a former one which was removed in 1825. The old vessel had two lights, but the present has only one, though of great brilliancy. At the sunk sand there is a floating light, which is an excellent guide for the King's Channel; this is only four miles from Harwich lighthouses, for there are two of different heights, which must be kept in a line in going through the channel to that place. There are two towers with a light in each at the same height, but one of these towers was in 1818 raised forty feet above its lightroom, in order to serve as a day-mark.

On the north passage through the sands, there is a great shoal called the Galloper, extending about four miles in length and being half a mile wide, with only six or seven feet water at low tide. Ever since the year 1804, a vessel has been moored at the south-west end of the sand, in which two lights are exhibited horizontally, from sunset to sunrise. This may be readily distinguished from the Sunk and the Goodwin lights, as the former exhibits but one and the latter three lights.

There is a lofty lighthouse on the north Foreland, which is an ancient erection of great importance to ships coming in from sea, by which a ledge of rocks which stretch two-thirds of a mile northward from that point, may be avoided. On the pier-head of Ramsgate a light is placed, the principal object of which is to serve as a guide to the harbour. As the lights from the windows of the town were liable to be taken for this, shades of red glass have been affixed, so as to produce a clear red light easily distinguishable.

The floating light of the Goodwin is intended chiefly for the benefit of vessels arriving from the northward, which, if possible, keep to the eastward of it. In order to distinguish this from the lights on the two Forelands, three distinct lights are exhibited from the vessel, which is with one mast and a yard crossing it securely moored. The middle of these three lights is considerably higher than those at the two extremes, thus forming an erect triangle not easily mistaken. In foggy or hazy weather, a bell is kept constantly ringing on board, to warn ships that they are near the north end of the sand. On board this vessel, thus kept continually in motion, the small crew is frequently for a long time completely cut off from all intercourse with the shore. On the south Foreland there are one or two lighthouses, but these scarcely belong to the mouth of the Thames, being placed chiefly with a view to prevent vessels from running on the Goodwin sands.

Docks.

Complaints, as the commerce of London increased, became very frequent, of the crowded state of the river, of the delay and difficulty of procuring good berths for ships, and of the want of accommodation for discharging cargoes, owing to the scarcity or the distance of commodious warehouses. These complaints called the attention of the merchants and ship-owners, and at length that of the government, to the subject. There were many difficulties to be surmounted, arising from the vested rights of the corporation, and of private individuals who had property in the mooring chains, in the legal quays, the suffrance wharfs, the upland warehouses, and in lighters or other craft, all of which would be injured by the construction of docks. Mr Pitt, then minister, applied all the powers of his mind to the subject in the committee of the House of Commons; and at length, after seven years' agitation, and with ample compensation to the sufferers, the law was put in force by the commencement of the West India Docks, in February 1800, and by their being opened for the reception of ships in August 1802.

West India Docks.

These, the first establishment of the kind in London, were formed in the gorge of an isthmus called the Isle of Dogs, on the Middlesex side of the river. They comprised at first an import and an export dock, each communicating with one basin of five or six acres in extent, with the main river at Blackwall, and another of two acres at the other end near Limehouse; and parallel to these was constructed the city canal, which having been rendered useless by the application of steam-vessels to tow ships, has been recently also formed into a dock, and contains nineteen acres, now used as a depôt for bonded timber.

The export dock, where eastward-bound ships are loaded, is the smaller of the two, being about twenty-five acres in extent. The import dock is of the same length, but thirty feet wider, and occupies thirty acres of ground. The locks by which admission to both is gained, are forty-five feet wide, and consequently admit vessels of 1200 tons burden. At the highest spring-tides the water is twenty-four feet deep; and there is within the docks sufficient space for 600 vessels of from 250 to 600 tons burden. A great benefit has been gained, both by the revenue and the traders, by the separation of the import from the export dock. They are parallel to each other, but are divided by stacks of warehouses, the chief commodities in which are rum, brandy, and other spiritous liquors. There are sheds on the side of the export dock, which afford shelter for goods sent for exportation. The chief warehouses for import goods are on the quays which bound that inclosure. They are admirably contrived for the reception, preservation, and delivery of goods, and are capable of storing 170,000 hhds. of sugar, besides coffee and other tropical productions.

The whole space occupied by these docks and warehouses extends over 295 acres. It is inclosed on every side; all the buildings are fire-proof; and the premises are well guarded by watchmen, so that the system of pilfering, formerly practised to a great extent on the river, is completely abolished. The carts or waggons which convey goods to town are loaded from the backs of the warehouses, without entering the dock-gates. The capital of the company which built and now superintend the docks is L.1,380,000, raised by subscriptions at different times. The proprietors were limited to ten per cent. interest, and if the income amounted to more, the tolls and storage were to be reduced in price. This establishment had the monopoly of the West India trade during the first twenty years after their construction. At that time they accumulated a sum which in 1819 induced them to lower their rates. But of late, from the competition of other companies, though their profits did not reach ten per cent., they have been induced to diminish the rates. The dividend now scarcely exceeds five per cent.

The nearest end of these docks is at Limehouse, three miles from the Royal Exchange, and the other end at Blackwall is half a mile farther. The expense of cartage, though the road is excellently paved, is therefore greater than from the docks which have been subsequently constructed, and it is doubtful if the benefit to the shipping by not proceeding so high up the river is an adequate compensation.

Some admirable contrivances have been recently adopted, by which the great body of water in the docks is kept always sweet, and by which the constant deposit of mud from the water of the river is carried away gradually.

London Docks.

The docks which next followed the West India in their construction are the London Docks, situated between Ratcliff Highway and the Thames. They were begun in June 1802, and opened for the admission of vessels in January 1805. They were originally planned chiefly to receive ships and their cargoes loaded with tobacco, wine, brandy, and rice. They consist of two docks of unequal extent; the western covering a space of twenty acres, and the eastern of about seven acres. The latter is entered through a small basin from Shadwell, and the former has two through their basins, the one between Wapping Old Stairs and Bell Dock, and the other at the Hermitage. The whole can commodiously receive 500 vessels of from 200 to 800 tons burden. The warehouses are very magnificent; the most extraordinary is that for bonded tobacco. The roof and pillars which support it are of iron, and the whole building covers five acres of land, and is capable of containing 24,000 hogsheads of that commodity. There is another warehouse for tobacco, but of smaller dimensions. The vaults under these and the other warehouses are in extent more than eighteen acres, and have space to store 66,000 pipes of wine or spirits. This company, like that of the West India Docks, had a monopoly for twenty-one years, which expired in 1826; by this all vessels loaded with wine, brandy, tobacco, and rice were bound to discharge their cargoes on their premises.

The company is governed by a directory, of whom the Lord Mayor and a certain number of aldermen form part. Their capital was L. 3,328,000; and besides that, as they had to pay for 1300 houses, which were taken down to make room for the operations, they were compelled to borrow L. 700,000. This great expenditure, and the rivalry of other similar associations, which have reduced the rates of tolls and storage, have of late only enabled the company to pay two and a half per cent. interest to the proprietors.

The regulations to prevent fire and pilfering are as effectual in those as in the West India Docks. The whole consists of seventy-one acres, and is walled, and the hours for admission and for working are the same as in the other docks.

East India Docks.

The East India Docks followed those of London. The commencement of the work took place in 1803, and its completion in 1806. They are at Blackwall, and designed for the trade of the East India Company. They consist of an import basin of eighteen acres, and of an export basin of about nine acres, with an entrance basin of $2\frac{3}{4}$ acres. As they were constructed to receive ships of great burden, the length of the entrance lock is 210, and the depths of the gates forty-eight feet, and there is never less than twenty-three feet of water. The extent of warehouse-room is small, as most of the commodities unloaded here are carried immediately to the Company's warehouses in the different parts of London. The tea and the more valuable goods are conveyed in covered waggons, secured by locks, along the Commercial Road, which has been constructed to communicate with these and the other docks. The capital of the Company is L. 500,000, paying a dividend of four per cent. The directors of the Company have the chief management, and the ships are loaded and discharged by their servants, not by the crews; and the regulations to prevent fire and plunder are of the strictest kind.

St Katharine's Docks.

St Katharine's Docks, the last that have been constructed, are situated between the London Docks and the Tower. Though a great work, it was executed within a year and a half, and first opened in October 1828. The whole extent of the property is twenty-four acres, of which nearly one-half is included in the two docks, communicating by a basin between them. The entrance is near Irongate, where the lock from the river is 180 feet long, and 45 feet broad, and is so constructed as to admit ships of 200 tons burden to pass out three hours before high water, so as to enable them to reach Blackwall before the ebb of the tide begins. Ships of 800 tons burden can be conveniently received into these docks, as the water at the entrance is deeper than at any of the other docks, and they can enter or depart by night as well as by day; and vessels drawing eighteen feet water may be afloat at a buoy opposite the gates at low water. The two divisions are estimated to be capable of receiving annually about 1400 merchant vessels. The warehouses are very large and commodious, and, being partly erected upon pillars close to the water, goods are craned up to them direct from the hold of the discharging vessel, at a diminished expense of time and labour, whilst the space is also thereby economised. The whole work has been executed with great skill, taste, and judgment, and its situation being within a quarter of an hour's walk from the Royal Exchange and the Custom House, is a very great accommodation.

The expense of this concern has been very great for its extent, arising chiefly from the number of houses which required to be purchased and pulled down, to make way for the excavation. The capital originally raised was L. 1,350,000, since which L. 800,000 have been borrowed on the security of the tolls, for the completion of the works, and the purchase of land, possessing river frontage, from the Tower to the corner of Lower East Smithfield. This, which cost more than L. 100,000, has been recently made applicable to the erection of a wharf, at which steam-vessels can take in or land passengers without the inconvenience of embarking by means of wherries. The regulations of this dock and the charges are similar to those of the other.

Commercial Docks.

On the right bank of the Thames, extending along the side of the river at Limehouse, reaching from Dog and Duck Stairs to near Cuckold's Point, and terminating nearly opposite to the entrance of the West India Docks, are the Commercial Docks, and parallel to it the Surrey Canal. The Docks are of great extent, inclosing within walls forty-nine acres, of which thirty-eight are water. They were designed to receive vessels loaded with timber, corn, and other commodities which are more bulky than costly. The warehouses are neither extensive nor commodious, and their establishments not so constructed as to entitle them to become bonding warehouses for many kinds of goods. They are entered by a basin near Dog-and-Duck Stairs, which is sometimes called the East-Country Docks, and the main body of the water within is divided into three unequal parts. The Surrey Canal consists of an inner and outer dock at its entrance, in which ships are received; but at present it is chiefly used for the reception of vessels offered for sale. There is a communication by it with the Croydon Canal. As the ships employed in foreign or colonial commerce generally enter these docks to discharge or take in their cargoes, there is room left in the river Thames for the coasting trade, including that with Ireland and Scotland. Of these the greater portion are such as are loaded with coal from the northern counties, which are allowed to anchor in what is called the Pool, a part of the river extending from the Custom House to the entrance of the Regent's Canal, near Limehouse. In this part, 210 vessels may anchor at one time; but the average number of them does not exceed 180, though about 7000 ship-loads of coals are annually discharged.

As the Regent's Canal terminates near the London and the West India Docks, it may be appropriately noticed in this place. The chief object of this work was to save the expense of cartage through London of those articles brought by sea and afterwards forwarded for consumption to the distant parts of the metropolis in the north-west division, and to communicate there with the Grand Junction Canal. It therefore passes in a circular course round London from Paddington on the west to Limehouse on the east. It passes by a tunnel under Maida Hill to the Regent's Park, and from thence to Islington, under the street of which it is carried through a tunnel about three quarters of a mile in length, where there is a large basin. It then proceeds to Hoxton, Hackney, and Limehouse. It is nine miles in length, and has twelve locks so admirably contrived, and so large, that barges eighty-three feet long and fourteen wide can pass and not occupy more than three and a half minutes in passing. It has much trade in coals, and some in conveying goods from London to be sent to the northern parts of the kingdom. It has been found a very expensive work, and, whatever may hereafter be its increase of trade, does not at present pay more than fifteen shillings interest on 21,400 shares of L.100 each.

It would serve to give some idea of the trade of London in general, and the utility of the docks as subservient to it, if our limits would allow of an enumeration of the names and the quantities of all the commodities under the king's locks in the several bonding warehouses of the port. We have only room to notice some of the most prominent.

Account of some articles in bond in London the 5th January 1833.

Wheat,	260,384 qrs.
Barley,	7,908 ...
Oats,	42,290 ...
Wheat flour,	123,346 cwt.
Number of Canes for walking,	5,254,421
Gum lac,	1,989,228 lbs.
Pimento,	1,181,855 ...
Number of goose quills,	14,822,900
Silk, raw and thrown,	2,006,079 lbs.
Rum,	2,682,270 gals.
Brandy,	738,929 ...
Gin,	27,489 ...
Tobacco, unmanufactured,	22,694,725 lbs.
Ditto, manufactured,	229,765 ...
Wine, Cape,	322,769 gals.
French,	380,843 ...
Canary,	87,355 ...
Madeira,	376,171 ...
Portugal,	1,442,869 ...
Rhenish,	40,452 ...
Spanish,	2,111,329 ...
not described,	142,897 ...
Tallow,	813,821 cwts.
Tea,	49,617,300 lbs.
Cotton wool,	8,411,252 ...
Pepper,	9,903,109 ...
Sheep's wool,	3,063,762 ...
Indigo,	8,843,407 ...

An account of the Number and Tonnage of Ships that have entered the Port of London with cargoes from foreign parts, distinguishing the countries from whence they have arrived, in the years 1830, 1831, 1832, 1833, *and* 1834.

Countries.	1830.		1831.		1832.		1833.		1834.	
	Ships.	Tonnage.	Ships.	Tonnage.	Ships.	Tonnage.	Ships.	Tonnage.	Ships.	Tonnage.
Russia,	505	113,919	692	147,250	415	92,859	405	186,166	470	112,183
Sweden,	91	17,921	106	24,482	37	10,177	63	18,384	98	26,397
Norway,	91	30,493	138	40,510	82	26,505	102	31,859	137	40,485
Denmark,	203	17,866	222	21,490	103	11,532	80	7,697	229	21,048
Prussia,	530	94,726	402	82,891	230	44,346	175	41,107	161	37,261
German States,	419	63,424	380	53,649	282	46,554	291	48,258	339	56,525
Netherlands,	725	77,555	686	75,470	502	52,104	586	65,006	706	88,832
France,	259	28,231	403	39,232	305	29,964	385	33,955	403	36,300
Portugal, Azores, and Madeira,	280	26,999	353	33,292	256	25,708	381	37,725	363	38,898
Spain and Canaries,	270	30,100	372	83,881	204	21,965	324	37,983	266	30,574
Italian States,	132	18,931	193	32,939	105	14,525	132	20,188	128	20,939
Ionian Islands,	18	2,535	31	4,645	26	3,575	33	4,464	25	3,637
Turkey and Continental Greece,	47	6,781	72	10,105	67	9,339	58	8,481	69	9,538
Morea and Greek Islands,	4	562	10	1,285	13	1,985	9	1,350	14	2,026
Egypt,	6	4,509	15	3,341	5	862	...	...	4	756
Tripoli, Barbary, and Morocco,	10	960	12	1,178	9	957	132	29,812	28	3,438
Foreign Asia,	12	4,406	9	3,261	7	2,201	186	96,375	9	3,279
China,	22	27,782	21	27,889	20	25,237	...	...	27	28,199
United States of America,	66	22,485	114	38,757	73	27,156	62	23,589	75	27,169
Foreign West Indies,	41	8,341	48	9,902	57	13,058	42	7,036	34	7,015
Foreign Continental Colonies in America,	84	15,815	106	20,930	78	15,416	76	14,652	89	16,930

In the trade with Russia, somewhat more than nine-tenths is carried on by means of British vessels. In that with Sweden, Norway, and Denmark, the case is the reverse, and five-sixths is carried on in vessels of those countries. In that with Prussia, whose ships are of a larger size upon the average than those of Great Britain that frequent the Baltic, their tonnage in London is about double of our own. The commerce with the other states of Germany, employs double as much tonnage in British as in foreign ships, and the same proportion is found in the trade with the Netherlands. In the intercourse between London and France, the number of British vessels employed is to that of foreign as seven to six; but as the average of British vessels is somewhat larger, the proportion of tonnage is as eight to five in favour of our own shipping. The vessels which bring cargoes to the metropolis from Portugal, the Azores, and Madeira, from Spain and the Canaries, and from the Italian states, are almost wholly British, as the number and tonnage of the foreign ships that arrive, do not amount to more than two and a half per cent.

The commerce with the Ionian Islands, with Turkey, and Continental Greece, with the Morea and the Greek Islands, with Egypt, with Tripoli, Barbary, and Morocco, with the foreign territories in Africa and in Asia, and with China, is wholly in British-owned vessels. In the London trade with the United States of America, the foreign vessels, mostly those of the States, are to the British vessels in the proportion of nearly four to one. The commerce with the West Indies, and with the continental colonies in America, is almost wholly conducted in British ships, as out of 500 sail of vessels that arrived in the Thames with cargoes from those parts there were only forty, and those of small size belonging to foreigners.

The whole of the commerce of Great Britain, with the colonies of North and South America, with the islands in the West Indies, with the settlements on the coast of Africa, and with the East India Company's extensive territories, is carried on by British ships alone; but it is not easy to estimate what proportion of it employs ships belonging to London. In fact, those which at one period of the year are employed in one branch of commerce, are often employed in another in a different part of the same or of a succeeding year. Many, too, of the British ships which arrive at or depart from London, are owned by persons resident in other, especially the northern, parts of the kingdom.

In the absence of any recent account, it may be as near an approximation to accuracy as can be obtained, if the number and tonnage of the vessels belonging to the port of London be assumed to bear the same proportion to the number of those that belong to the whole of the kingdom, as is exhibited by the net amount of the produce of the duty of customs. In this view the year 1833 may be taken, when the whole sum drawn to the revenue from the three kingdoms was L.18,575,182 : 15 : 9, and the sum drawn from the port of London was L.7,662,521. In that year the tonnage of all the ships in the United Kingdom, and of our possessions in Europe, was 2,271,301. Of this a vast part were occupied in the coasting trade, and the vessels so employed were, in most cases, owned by persons in the out-ports. The fisheries, whether for herrings, ling, or pilchards, on our own coasts, as well as those for whales in the northern ocean, or for cod on the banks of Newfoundland, are mostly conducted in vessels also owned at the out-ports; and though the southern whale-fishery is chiefly carried on from London, the tonnage it employs is insignificant when put in comparison with that of the other branches here noticed. If a deduction be made for the tonnage of the coasting vessels, including the colliers, and of the fishermen, to the amount of 650,000 tons, from the 2,271,300 tons which appear on the register, there will remain about 1,620,000; and, in conformity with the view of reckoning the tonnage by the custom's revenue, that of London being near two-fifths of the whole kingdom, so, if the shipping of London be two-fifths of that of the whole tonnage on the register, it will be about 650,000, which cannot be very far from the truth.

It is not easy, within a moderate compass, to give even a sketch of the foreign commerce of London. It would be an epitome of that of the whole world. The British capital is the emporium to which are brought the products of all soils, and all climates, whether such as are spontaneously produced, or such as have been gradually created by ages of observation and application. It has in store ready for distant commerce, or for domestic use, whatever the ingenuity and industry of man in any part of the globe can spare to exchange for what his own country, or climate, or skill, cannot yield him. We could, therefore, do little more here than point out, as we have done, the foreign countries with which the chief intercourse is maintained, and the proportions of it, as far as they can be indicated by the number and size of the vessels that convey their commodities.

An Account of the Number of Vessels, and their aggregate Tonnage, that have entered the Port of London from all foreign countries in each year from 1820 *to* 1834.

Years.	British.		Foreign.	
	Ships.	Tonnage.	Ships.	Tonnage.
1820,	3354	655,239	856	122,619
1821,	3000	585,994	571	89,073
1822,	3230	603,167	597	106,099
1823,	3031	611,451	865	161,705
1824,	3132	607,106	1643	264,098
1825,	3989	785,565	1743	302,122
1826,	3495	675,026	1586	215,254
1827,	4012	769,102	1534	221,008
1828,	4084	767,112	1303	195,129
1829,	4108	784,070	1300	215,605
1830,	3910	744,229	1268	207,500
1831,	4140	780,988	1557	269,159
1832,	3274	640,057	886	154,514
1833,	3421	678,289	1061	175,183
1834,	3786	735,693	1280	216,063

Customs.

On account of the fire at the Custom-house in 1814, which destroyed the accounts of many years before 1800, it is not easy to ascertain what was the amount of duty collected by the commissioners of the customs prior to that date; and some of the accounts of subsequent years having also been then destroyed, the series is very much broken till 1825. The following is all that can now be obtained.

Statement of the Gross and Net Receipt of the Customs-duty at the Port of London, as far as the same can be made up from existing documents.

Year.	Gross Receipt.	Net Receipt.
1800,	L.5,663,704	
1805,	6,907,027	
1810,	8,472,207	
1815,	7,789,726	L.5,536,441
1820,	7,474,387	5,342,731
1824,	7,679,409	5,731,238
1826,	10,291,877	8,829,789
1827,	10,402,859	8,790,829
1828,	10,529,115	8,918,310
1829,	10,211,037	8,524,261
1830,	10,307,208	8,576,163
1831,	9,465,339	7,916,993
1832,	9,334,299	7,876,660
1833,	8,692,898	7,662,521
1834,	10,697,263	9,576,972

The comparative commercial importance of London may be shewn by contrasting the amount of the duty of customs collected in it, with that collected at the greatest of the maritime towns within the three kingdoms.

Net Amount of Duty collected at the Customs in the year 1833, as transmitted to the Treasurer.

London,	L.7,662,521	8	9
Liverpool,	3,555,955	14	5
Bristol,	1,016,873	10	1
Hull,	592,161	16	10
Dublin,	546,467	1	2
Greenock,	383,927	19	7
Newcastle,	273,686	16	9
Leith,	246,536	5	7
Belfast,	194,565	3	2
Cork,	161,690	7	6
Glasgow,	159,795	12	2
Port Glasgow,	152,564	0	6
Waterford,	103,754	17	10
Gloucester,	102,875	9	8
Limerick,	97,624	16	5
Plymouth,	89,941	6	6
Whitehaven,	82,090	18	10
Sunderland,	75,364	3	9
Exeter,	58,887	17	4
Londonderry,	56,905	5	9
Aberdeen,	49,870	13	0

One of the chief sources of occupation for shipping is the conveyance of coals to London. They are chiefly brought from the north-eastern side of the kingdom, and sold on their arrival by the cargo at an appropriate building in Thames Street, called the Coal Exchange. The great dealers sell the coals by barge-loads to the lightermen, wharfingers, and other retailers; and when they are discharged from the vessels that bring them to the Pool, they are usually kept in coal barges at the several wharfs, ready to supply the consumers. A great benefit has lately been conferred on the public by the change in the mode of selling coals, substituting weight instead of measure, or the ton for the chaldron. As coals measure more when much broken, it was the interest of the dealers to break the large lumps; but now that they are sold by weight, they have no inducement to break them, and they are delivered more lumpy. Each waggon or cart that brings coal to the consumer, is bound to bring appropriate weights and scales, and to weigh such part, if the buyer should require it. By this some of the tricks formerly played in this trade are prevented. The ton of coals is sold, including cartage, which varies according to the distance from the water side, and the porterage, according to the quality, from 24s. to 30s. The chaldron, which was before the law 1st and 2d Will. IV. cap. 67, the legal measure, weighs one ton five hundreds and a half.

The quantity imported in each of the ten last years has been as follows:—

	Tons.
1825,	1,992,104
1826,	2,040,291
1827,	1,882,321
1828,	1,960,559
1829,	2,018,975
1830,	2,079,275
1831,	2,045,292
1832,	2,139,078
1833,	2,010,409
1834,	2,078,685
1835,	2,104,602

The institutions of the city of London, which have grown up with and out of its commerce, are highly appropriate, by their localities, their arrangements, and their regulations, for conducting business. The first object of importance to every ship, on its arrival in port, is the *Custom-house.* This noble building has been erected on the site, but with much enlargement, of a similar building which was destroyed by fire in 1814, as the preceding one had been by a similar calamity in 1718. A considerable extension, and many alterations in the building, had been commenced before the last fire occurred, but that accident induced the erection of an entirely new edifice, which was opened for public business in May 1817.

Custom-house

The custom-house stands in Lower Thames Street, but its principal front is towards the river, with a broad wharf, having noble stairs at each end, by which to descend to the water, whence wherries are constantly plying for passengers, who can embark or land at them with their baggage, but where no goods are allowed to impede the way. The length of the front is 480 feet, and it is 60 feet in depth. On the view from the river, the front exhibits itself best, with three porticos, each composed of six pillars of the Ionic order, the centre one of which projects somewhat more forward than the others, and is more elevated from the ground by standing on arches. On the top of it is a balustrade, with a clock in the centre.

The arrangements of the interior are, however, most to be admired. The long room, where most of the public business is transacted, is a noble apartment 186 feet in length, and 60 in breadth, of an appropriate height, with desks on each side for the several officers, and the centre left open for such of the public as have business there. The other parts of the edifice are distributed with great judgment into apartments adapted for the several branches of the office, in such a way that between six and seven hundred officers, and more than a thousand tidewaiters and messengers are enabled to work with regularity and dispatch, thus forming a most pleasing contrast to the confusion, difficulty, and delay which formerly prevailed.

An accident happened to this building in 1825, when a part of the long room fell in; it was found that the foundation had been insecurely constructed, upon which the centre was taken down and rebuilt as it now appears, under the direction of Mr Smirke.

The improvements on the building and its arrangements, great as they are, are trifling, when compared with the vast reform in the whole system which took place by the law of 1812 (act 51st Geo. III. cap. 7.), and by other salutary regulations. Before that time, the highest offices were held by patent, and the duties performed by deputies, and both were paid by fees. These were abolished, and all are now paid by salaries. Patronage in promotion has been relinquished, and the road opened to the advancement of the most meritorious officers; and, by an order of the Treasury, when the Duke of Wellington was at its head in February 1830, the salaries of the commissioners and other officers were prospectively reduced; whilst directions were given to revise the whole establishment, with a view to every possible reduction.

Bank of England.

The *Bank of England* is one of the most prominent objects within the city, not so much from the structure, though that is magnificent, as from the great influence its creation and progress have had on the state of society in general, as well as on the commercial intercourse which it has facilitated between different individuals at home, and between distant countries with this kingdom, and with each other.

The company was first founded in the reign of King William III., by act of parliament, in 1694; the idea having been taken from the Bank of Amsterdam, established eighty-five years before, whose success had been great, and its influence seductive. After the incorporation, which provided that the company should be under the management of a governor, a deputy-governor, and twenty-four directors, to be annually chosen, the business was for many years carried on at the Hall of the Grocers, in the Poultry.

It remained there some years, till the success of the undertaking had warranted the court of directors to purchase a piece of ground, covered with buildings of little value, in Threadneedle Street. Upon this a house was erected, on a comparatively small scale, to which the business was transferred in 1733; and soon afterwards, the present hall was opened, as well as the bullion-office. The façade was then extended under the direction of Sir Robert Taylor, and two wings were added, with the returns on the east and west sides, and several offices. In this work, it was found expedient to remove the church of St Christopher le Stocks, with the memorials of those who had been interred there. The whole of this enlargement gradually advanced from 1770 to 1786, when, by the death of Taylor, Sir John Soane became the bank architect, and he, in 1788, completed that part of the plan. Under the superintendence of his judgment and taste, the front and wings of the original structure were rebuilt in one harmonious manner; and various other alterations having been adopted, the whole was, in 1825, completed in conformity with the judicious designs of that most distinguished architect.

From the nature of the ground, fronting towards three public streets, on which it was practicable to intrude, the area is an irregular square, having a front of 365 feet on the south or principal side, and 410 on the north side, on the east side a front of 245 feet, and on the west of 440 feet; this is so managed, that it does not appear to be a defect, from whatever point the whole mass is surveyed.

The principal entrance is from Threadneedle Street, though there is one from Bartholomew Lane, and another from Lothbury. The interior contains eight open courts, the rotunda or circular room, numerous large and smaller offices, several committee rooms, and private apartments for the residence of officers and servants. The principal divisions and subdivisions of the structure are on the ground floor, and there are no rooms over the chief offices, whose height forbids the erection of such; but beneath there are capacious vaults, and a greater number of rooms than above ground. Within the building is an apartment for the guards, and a separate room for the officers who have the command.

It would require an elaborate work to describe all the particular beauties of this edifice, or the peculiar adaptation and arrangement of its offices for the management of the vast operations which are daily transacted; but to the adaptation of the offices to the purposes for which they are designed, the public are indebted for the order, expedition, and security with which every thing is conducted. The principal or great division, for several of them have subdivisions, are the great hall, the dividend offices, the discount-office, the bullion-office, the accountant's office, the chief cashier's office, the interior office or check upon forgery, and the parlour or apartment in which the directors assemble. All of these are neat, clean, and light, and some of them are elegant in their decorations and their furniture.

The Bank has, by successive renewals of its charter, since the first was granted in 1694, when the capital was L.1,200,000, been enabled to increase it to the present amount of L.14,553,000, which is lent to government at an interest of three per cent. The dividends on this capital have varied with the amount of profit gained by its various operations. At first it was 8 per cent.; in 1697, 9 per cent.; between that period and 1767, its fluctuations were frequent, but never lower than 4½ per cent. nor higher than 6 per cent.; in 1788, it was raised to 7 per cent.; in 1807, to 10 per cent.; in 1823, it was lowered to 8 per cent., and has continued at that rate to the present time. But besides the annual dividends, the directors have, at several periods, when any peculiar prosperity has attended the operations, distributed, under the name of bonus or some other, large sums to the holders of their stock, within the last thirty-six years.

The profit of the Bank is derived from various sources, which were laid before parliament, for the year ending the 29th of February 1832, were enumerated as follows:

Interest on commercial bills, ...	L.130,695
Interest on Exchequer bills, ...	204,109
Annuity for 45 years (dead weight), . .	451,415
Interest on capital received from the government, ...	446,502
Allowance received for the management of the public debt, ...	251,896
Interest on loans on mortgages, . . .	60,684
Interest on stock in the public funds, . .	15,075
Interest on private loans, ...	56,941
Profit on bullion, commission, rent, receipts on discounted bills unpaid, management of the business of the Banks of Ireland, of Scotland, and the Royal Bank of Scotland, and sundry items,	71,859
	L.1,689,176

The expenses of the Bank for the same year are thus stated in the parliamentary reports:—

Salaries and pensions, ...	L.218,003
House expenses, ...	30,187
Directors' allowance, ...	8,000
Rent, ...	40,000
Expenses of eleven branches arising from the banking department, ...	5,702
Expenses attending the circulation of L.2,500,000 of Branch Bank of England notes, at eleven branches, ...	28,508
	L.339,400

The amount of the notes of the Bank of England in circulation, has, since its establishment, varied from L.1,200,000 to L.30,000,000; of late years it has varied only between L.17,000,000 and L.24,000,000. The average during the last fifteen years may be taken at L.20,000,000; whilst the deposits of government, on the average, have been L.4,000,000, of which sum, thus amounting to L.24,000,000, one-third is estimated to be invested in bullion, and two-thirds in securities. By the parliamentary investigation which produced the preceding accounts, it appears that the balance of the Bank, or surplus property, in 1832, was L.2,637,760
To which is to be added the capital, . . 14,553,000

Thus leaving together . . L.17,180,760

a sum quite sufficient to make its stability as firm as the British government.

The following account will shew how much diffused is the property which is vested in the public funds, the dividends of which are payable at the Bank; and how much larger is the proportion in the hands of the middle classes than that belonging the large stockholders.

London.

An Account of the Number of Persons who were entitled to Dividends upon those portions of the Public Debt which became payable on each of the usual Quarterly Periods of the Year 1831 ; *arranged in various Classes, according to the Amount of Dividend to which they were entitled.*

Description of Stock.	Not exceeding L.5.		Not exceeding L.10.		Not exceeding L.50.		Not exceeding L.100.		Not exceeding L.200.		Not exceeding L.300.		Not exceeding L.500.		Not exceeding L.1000.		Not exceeding L.2000.		Exceeding L.2000.		Totals.	
	Due.		Due.		Due.		Due.		Due.		Due.		Due.		Due.		Due.		Due.		Due.	
	5th April 1832.	10th October 1832.	5th April 1832.	10th October 1832.	5th April 1832.	10th October 1832.	5th April 1832.	10th October 1832.	5th April 1832.	10th October 1832.	5th April 1832.	10th October 1832.	5th April 1832.	10th October 1832.	5th April 1832.	10th October 1832.	5th April 1832.	10th October 1832.	5th April 1832.	10th October 1832.	5th April 1832.	10th October 1832.
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Nc.	No.	No.	No.	No.	No.	No.	No.	No.
On 3 p. ct. Reduced Annuities,	10,189	10,347	4,773	4,745	11,855	11,681	3,498	3,473	2,135	2,175	755	742	443	453	238	231	74	77	33	34	33,723	33,958
... $3\frac{1}{2}$ per cent.	6,928	7,019	4,305	4,362	10,157	10,173	2,900	2,909	1,568	1,561	412	411	255	251	113	112	35	36	15	15	26,668	26,849
.. $3\frac{1}{2}$ p. cent. Annuities, 1818,	208	198	157	162	464	399	176	211	136	127	45	57	37	38	25	30	4	6	5	4	1,257	1,232
... 4 p. cent. Annuities, 1826,	1,540	1,601	961	993	1,949	2,044	505	512	302	312	92	92	54	59	16	15	8	5	2	3	5,429	5,636
... Long Annuities, . . .	9,239	9,078	4,244	4,212	8,423	8,361	1,544	1,516	765	725	196	187	107	99	37	34	7	5	1	4	24,563	24,221
... Annuities for terms of years,	1,558	1,519	806	787	1,609	1,632	347	351	178	178	55	56	35	32	20	20	7	4	3	4	4,618	4,583
Totals, . .	29,662	29,762	15,246	15,261	34,187	34,290	8,970	8,972	5,084	5,078	1,555	1,545	931	932	449	442	135	133	59	64	96,278	96,479
Number of each class entitled to Dividends in 1831, ...	29,414	29,827	14,962	15,109	33,816	34,130	8,961	8,894	5,104	5,072	1,554	1,561	964	942	445	448	134	132	66	62	95,420	96,177

Description of Stock.	Not exceeding L.5.		Not exceeding L.10.		Not exceeding L.50.		Not exceeding L.100.		Not exceeding L.200.		Not exceeding L.300.		Not exceeding L.500.		Not exceeding L.1000.		Not exceeding L.2000.		Exceeding L.2000.		Totals.	
	Due.		Due.		Due.		Due.		Due.		Due.		Due.		Due.		Due.		Due.		Due.	
	5th July 1832.	5th January 1833.	5th July 1832.	5th January 1833.	5th July 1832.	5th January 1833.	5th July, 1832.	5th January 1833.	5th July 1832.	5th January 1833.	5th July 1832.	5th January 1833.	5th July 1832.	5th January 1833.	5th July 1832.	5th January 1833.	5th July 1832.	5th January 1833.	5th July 1832.	5th January 1833.	5th July 1832.	5th January 1833.
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
On 3 p. ct. Consolidated Ann.,	28,639	28,722	13,650	13,749	32,477	32,601	9,572	9,612	6,297	6,286	2,095	2,141	1,438	1,424	739	709	244	234	72	77	95,223	95,555
... 3 p. cent. Annuities, 1826,	119	120	75	74	183	180	39	40	27	27	4	4	2	2	...	...	...	...	...	...	449	447
... New $3\frac{1}{2}$ p. cent. Annuities,	27,028	26,881	14,935	14,698	29,536	29,370	6,659	6,648	3,120	3,129	772	765	443	431	201	204	51	48	18	20	82,763	82,194
... New 5 per cent. Annuities,	32	35	33	31	108	107	37	36	19	20	3	3	4	4	1	...	...	1	...	...	237	237
... Annuities for terms of years,	1,687	1,656	847	835	1,770	1,757	333	333	157	161	38	37	33	34	10	12	4	4	9	10	4,888	4,839
Totals, . .	57,505	57,414	29,540	29,387	64,074	64,015	16,640	16,669	9,620	9,623	2,912	2,950	1,920	1,895	951	925	299	287	99	107	183,560	183,272
Number of each class entitled to Dividends in 1831, ...	58,756	58,321	29,828	29,736	64,504	64,631	16,733	16,653	9,668	9,700	2,973	2,936	1,926	1,923	953	941	278	283	106	104	185,725	185,228

East India House. The *East India House*, situated in Leadenhall Street, was first erected in 1726, but it has been gradually enlarged, so as now to form a building of vast size, accommodated to the various departments which the extent of the company's affairs require. Its principal front and a considerable part of the interior have been built within the last thirty years.

Towards Leadenhall Street it presents a front 200 feet in length, and having in the centre a portico of six Ionic fluted pillars, supporting a frieze with allegorical figures, and on the top a statue of Britannia. The interior has some fine apartments, especially the great court-room, in which meetings of the proprietors are held. The new sale-room is one of the most complete apartments in the city. It is adorned with pilasters, and with several appropriate paintings. The sale-room is also adorned with some fine statues of Lord Clive, Sir Eyre Coote, Sir George Pococke, and General Lawrence. The room of the committee of correspondence is embellished with views of Indian scenery, and with the portraits of Warren Hastings and of Marquis Cornwallis. The library is adorned with busts of the historian Orme and of Hastings; but is of inestimable value from the books, and especially the manuscripts, illustrative of the antiquities and the ancient and modern history of India, and other parts of Asia. The museum contains specimens of Indian arts and Indian curiosities of every kind, and especially the throne of Tippoo Sultan taken at Seringapatam. The company has several vast warehouses in different parts of the city. These they still retain; and, from their adaptation to the purpose, it is now in contemplation to occupy them as bonding warehouses for Indian and China articles.

East India Company. The East India Company was formed as a commercial body in 1599, and first obtained a charter from Queen Elizabeth in 1600. Although, in subsequent periods, the company acquired and extended vastly their territorial power, their commercial character remained to them until it was taken away by the law of 1835. They are now, therefore, a kind of board governing British India, under the superintendence of the Board of Controul chiefly, but with some power still left in the hands of directors chosen by the proprietors of India stock, whose dividends are guaranteed to them by the faith of parliament.

Trade with India and China. The following tables will show the value of the imports from, and the exports to, India as well as China, from the year 1820 to 1832.

An account of the Imports into Great Britain from all places to the eastward of the Cape of Good Hope (China excepted), in each year from 1820 to 1832, both included, distinguishing whether imported by the Company or by private Traders.

Year.	Value imported by the Company.	Value by Private Traders.	Total.
1820	L.1,737,137	L.4,201,389	L.5,958,526
1821	1,743,733	3,031,413	4,775,146
1822	1,092,329	2,621,334	3,713,663
1823	1,587,078	4,344,973	5,932,051
1824	1,194,753	4,410,347	5,605,100
1825	1,462,692	4,716,083	6,178,775
1826	1,520,060	5,210,866	6,730,926
1827	1,612,480	4,068,537	5,681,017
1828	1,930,107	5,135,073	7,065,180
1829	1,593,442	4,624,842	6,218,284
1830	1,593,566	4,085,505	5,679,071
1831	1,434,372	4,295,438	5,720,810
1832	1,107,787	5,229,311	6,337,098

An account of the Exports of Great Britain to all places eastward of the Cape of Good Hope (excepting China), in each year from 1820 to 1832, both included, distinguishing whether exported by the Company or by Private Traders.

Year.	Value by the Company.	By Private Traders.	Total.
1820	L.971,096	L.2,066,815	L.3,037,911
1821	887,619	2,656,776	3,544,395
1822	606,089	2,838,354	3,444,443
1823	458,550	2,957,705	3,416,255
1824	654,783	2,841,795	3,496,578
1825	598,553	2,574,660	3,173,213
1826	990,964	2,480,588	3,471,552
1827	805,610	3,830,580	4,636,190
1828	488,601	3,979,072	4,467,673
1829	434,586	3,665,678	4,100,264
1830	195,394	3,891,917	4,087,311
1831	146,480	3,488,571	3,635,051
1832	149,193	3,601,093	3,750,286

As the trade of the East India Company with China, up to the expiration of the trading concerns of that Company, centered wholly in London, a view of it belongs peculiarly to a description of the metropolis.

An account of the quantity of each of the articles of Chinese produce imported into London from the year 1803 *to* 1831.

Year.	Tea.	Silk.	Nanquin Cloth.	Miscellaneous Articles.
	lb.	lb.	Pieces.	Value.
1803	30,843,134	74,538	233,894	L.23,134
1804	26,680,784	90,362	264,407	26,184
1805	28,538,825	76,359	252,207	15,198
1806	22,155,557	18,607	376,234	10,504
1807	12,599,236	55,277	72,135	11,474
1808	35,747,224	117,855	484,647	17,617
1809	21,717,310	90,603	287,720	14,268
1810	19,791,356	54,376	305,009	14,890
1811	21,231,849	81,397	316,616	9,630
1812	28,318,153	86,197	503,276	12,929
1813[1]				
1814	26,110,550	150,629	783,253	29,054
1815	25,605,214	216,129	896,797	19,474
1816	36,234,380	88,987	396,453	29,050
1817	31,467,073	103,367	564,226	35,703
1818	20,065,728	146,878	409,349	19,510
1819	23,750,413	141,328	523,852	55,595
1820	30,147,994	271,115	969,746	70,827
1821	30,731,105	275,110	569,062	39,654
1822	27,362,766	222,673	287,431	23,419
1823	29,046,885	392,717	412,076	73,935
1824	31,681,977	293,014	1010,494	69,618
1825	29,840,401	142,676	392,998	75,963
1826	29,345,699	405,185	431,520	124,569
1827[1]				
1828	32,678,546	208,287	99,698	97,752
1829	30,544,382	606,916	529,602	95,412
1830	31,897,546	456,991	919,255	94,131
1831	31,648,922	476,692	857,171	89,796

[1] The records of this year were destroyed by fire.

An Account shewing the Value of the Articles exported to China from Great Britain, in each Year, from 1811 *to* 1833.

Years.	Broad Cloth.	Long Ells.	Camblets and Stuffs.	Lead.	British Iron.	Tin.	British Calicoes.	Cotton Twist.
1811.........	L. 142,293	L. 516,023	L. 175,169	L. 31,057	L. 6,837	L. 27,173	L. 4,774	
1812.........	174,542	524,496	207,383	3,352	16,679	62,521	5,487	
1813.........	207,589	461,338	159,869	7,249	21,879	49,499		
1814.........	212,664	351,332	132,047	17,852	11,823	37,694	...	L. 501
1815.........	354,047	359,469	156,962	17,927	10,969	22,691		
1816.........	218,026	321,652	159,581	16,325	3,892	29,930		
1817.........	172,604	353,035	134,034	12,948	6,259			
1818.........	157,513	283,229	124,779	16,928	7,014			
1819.........	223,362	335,004	157,218	18,963	7,884	...	3,365	
1820.........	204,699	312,382	140,721	11,437	13,040	...	4,131	
1821.........	219,610	334,112	91,772	11,047	11,147	...		
1822..	181,763	301,407	84,582	20,480	10,795	...	6,092	
1823.........	200,314	279,969	89,314	22,433	13,529	...		
1824.........	195,744	254,288	102,536	32,470	14,691	...	607	
1825.........	239,625	374,151	94,615	40,050	34,443	...	12,162	
1826.........	224,253	267,025	89,002	38,874	29,043	...	21,262	
1827.........	173,529	299,636	82,907	32,626	17,487	...	...	10,338
1828.........	163,067	212,799	55,721	17,793	18,179	...	40,213	626
1829.........	145,284	235,485	60,681	14,983	12,269	...	34,500	28,249
1830.........	149,255	213,277	20,358	21,792	11,312	...	19,010	34,952
1831.........	121,274	219,875	29,625	18,611	7,681	...	27,531	14,709
1832.........	195,273	159,078	21,714	20,863	190	...	21,925	11,963
1833.........	104,011	137,426	113,827	2,341	2,314	...	13,174	7,024

Besides the above articles there was an exportation of oreign cotton wool, in 1820, to the value of L. 93,402; of oreign skins, in 1823, 1824, and 1825, to the value of . 64,663; and of 54 bales of yarn, in 1829 and 1830, alued at L. 1291; whilst the annual stores sent out to the actory during the whole period of twenty-three years, mounted to L. 79,582.

The *Royal Exchange* is an edifice of more importance, rom the extensive mercantile affairs transacted within and round it, than either from its beauty or its extent, in both f which it is excelled by many other commercial cities. t the suggestion of Clough, who had been a clerk to Sir homas Gresham, and afterwards established as his repreentative at Antwerp, when that city was the great empoium of Europe, the knight undertook the construction of n exchange for London. It was completed in 1567, and was oon afterwards visited in state by Queen Elizabeth, upon hich occasion the title of Royal was conferred upon it. ll the upper parts were at that time filled with shops om the bottom to the top. That building was destroyed y the great fire of 1666, after which it was rebuilt in its resent form by a corporation of the city, and the company f mercers, at the expense of more than eighty thousand ounds. It was opened by Sir William Turner, lordayor, on the 28th of September 1669. In the new buildg the statue of Sir Thomas Gresham was placed within it, ut not in a conspicuous situation. There are also statues of harles I. and Charles II., and in the centre is a statue of Sir ohn Bernard, long the representative in Parliament of the ty, who gained and maintained his popularity by the tena- ty of his opposition to all the measures, whether good, bad, r indifferent, that were proposed by Sir Robert Walpole. he Exchange is a square, surrounded with arcades, and ivided into quarters assigned to the respective merchants ading to the different parts of the world, called the Scotch, rench, and American walks, or named from other countries; d some parts are known as the walks of different traders, ho did or might resort to them. These divisions are, owever, quite undefined, and by no means in practice so sed. Within the area there are no shops, but the walls are almost covered with placards, advertising sales of goods or of ships, and various other notifications. The outside all around is occupied by small shops, or by offices of brokers, notaries, and persons of similar calling. On the upper floor, on the north side, is Lloyd's Coffee-house, consisting of two long and lofty rooms, where the great business of insurance against losses by sea is conducted between brokers and underwriters. The society, who regulate this, employ agents in all ports, who furnish reports of the arrival and departure of vessels, and give the needful information as to the character, condition, and equipment of the ships. The accounts are registered accurately, and each subscriber has a book, into which are written, from time to time, by the clerks of the establishment, such descriptions of every vessel, as enable the underwriters to calculate the nature of the risk, and the premium it deserves. Upon the same floor is a large auction-room, an office for a jointstock insurance company, bearing the name of the building, and the office for the relief of sick and hurt seamen in the merchant service. An institution, called from the founder Gresham College, long occupied, or rather might have occupied, if hearers would have attended, a part of this floor. By will he left a part of his fortune to provide lecturers in divinity, astronomy, music, and geometry. Each of them had a salary of L. 100 per annum, but rarely delivered any lectures, as no auditors were in attendance. In consequence of this useless kind of expenditure, the trustees, in 1830, transferred the professors to the London institution, where, it is to be hoped, they may be found of benefit to the interests of science. The cellars under the Exchange are let out for warehouses. It has been calculated that, on an average, two hundred thousand persons daily visit the Exchange, but this can be little more than a guess. Much of the business which used to be transacted upon the Exchange has necessarily been divided, as commerce has gone on increasing; and the merchants and brokers resort much to coffee-houses in the vicinity of the building, which are distinguished by the names of the places with which the traders that frequent them have connexion, such as the East India, the New York, the Carolina, &c.

Most of the larger transactions are negociated by the means of brokers, who in general confine themselves to one branch of trade, with which their interest induces them to become thoroughly acquainted. Many of them embrace several branches; but those of the first class have large capitals or extensive credit, and are enabled to accommodate merchants with advances of money, or acceptances to a large amount upon the security of goods placed in their hands for disposal. In the West India trade some of them have large show-rooms, in which are exhibited samples of sugar, coffee, and the other tropical products. Ship-brokers are employed in buying and selling vessels, in hireing them by charter, in entering and clearing them out, in collecting the freights, and other business, which much abridges the labour, and saves the anxiety of ship-owners and ship-captains. Insurances, whether by joint stock companies, or by individual underwriters, are effected by the instrumentality of policy-brokers, who form a distinct class, and are paid by a commission of five per cent. on the premiums, and a fixed share of the profit which arises on the balance of their account with the underwriter. The rate of Exchange between London and the commercial cities in other parts of the world is fixed twice a-week between the drawers and the takers of foreign bills, and announced to the exchange-brokers at the close of each of the days.

Most of the brokers are licensed by the Lord Mayor and Court of Aldermen, but that does not apply to ship-brokers, nor in actual practice to most of the stock-brokers. Those so admitted must give security for the due performance of the duties entrusted to them, and not deal or make gain in goods; but it is apprehended this last condition is more generally broken than observed. There is a class of brokers which has come into existence within a few years, who are said to have made fortunes of an enormous amount. They are usually called bill-brokers, but are properly money-brokers, employed in arranging negociations in money matters of a large amount, between bankers, merchants, and others, who, in the fluctuating nature of their trade, either have occasion to lend or to borrow money upon indisputable security. Though the commission paid to such brokers is small, yet the extent of the transactions have made it a lucrative business.

Stock Exchange.

Near to the Royal Exchange is another institution called the *Stock Exchange*, wherein bargains are made for the real purchase and sale of property in the public funds, and where is carried on the enormous business of buying and selling stock for a future day, at a fixed price in speculation, as it is delicately called, though in fact, for the most part, it is only gambling upon a large scale. The house is near the Bank, and is conveniently arranged, and handsomely fitted up. It was erected in 1804, at the expense of the subscribers, who elect a committee to manage the affairs, and who have power to make regulations, and to admit or expel such members as they please. Near to it is the market for foreign funds; and in the rotunda of the Bank of England is a crowded assemblage, who carry on some real, but more gambling, transactions in public securities.

Having noticed those establishments in London which are chiefly subservient to the commercial intercourse between the metropolis and foreign countries, we proceed to mention others, whose main object is internal, though it extends also to external affairs.

Post-office.

The *Post-Office* is one of those institutions which in this country has arrived the nearest to perfection, and is not only worthy of the talent by which it has been advanced, but justifies the pride which its consideration inspires. It is not necessary here to trace the history of the establishment from the commencement, in the reign of Charles I., 1635, nor the advances it made up to 1784. At that period the letters were conveyed with dilatory irregularity which was the inducement of Mr Palmer of Bath to suggest and arrange a plan for the conveyance of letters by coaches. After due consideration, the experiment was first tried between London and Bath, and was found to be so safe, so quick, and so economical, that the scheme was in due time adopted, and every part of the kingdom in a few years became participators of the benefit, whilst the State drew from it a constantly progressive revenue. In 1783 the net proceeds of the Post-Office did not exceed L.145,000 per annum, and it now regularly yields about ten times that amount.

The old post-office in Lombard Street had been long complained of as inadequate, or ill adapted to the extent which the establishment had acquired; for it had grown, under the direction of Mr Palmer, first as comptroller, and of Mr, now Sir Francis Freeling, as secretary, to such a scale, that though buildings near to it had been added, the want of room prevented the most beneficial arrangement of the several branches of the institution.

The site chosen is central, sufficiently near for the purposes of commerce, and much nearer to the offices of government than the former spot. This magnificent but simple edifice was begun in St Martin's le Grand, in 1825, and the business transferred to it in 1829. It is of the Grecian Ionic order of architecture. The basement is of granite, but the superstructure is of brick, faced with Portland stone. The building is in length 400 feet, and in breadth 80 feet. The portico in the centre of the front is 70 feet broad, consisting of six columns of Portland stone, resting on pedestals of granite, and supporting a triangular pediment, beneath which is this inscription, "Georgio Quarto Rege," and the date in Roman capitals, "MDCCCXXIX." At the extremity of each wing is a portico of four columns. In this front are forty-four windows. The east front is quite plain, and has upwards of 180 windows.

Under the centre portico is a vestibule of noble effect, on the north side of which are the receiving rooms for letters, and apartments for the sorters of inland letters. These extend the whole length. The mails are received at the east front. The foreign-office is on the south side, as well as the offices of the receiver and accountant. At the east end of the vestibule are the twopenny offices. The sorters' room is an apartment of forty-six feet by twenty-four, in which their operations are performed with a dispatch and regularity that is astonishing. A novel mode has been adopted for conveying letters, which have come into the wrong department, from one room to another; they are placed in small waggons beneath the pavement, and made to travel through a tunnel by machinery.

The whole building is fire proof, and machinery conveys coals and water to every part of the building. The whole is lighted by gas, and is furnished with more than one thousand burners. The assistant-secretary has a residence in the building, and in the upper rooms are apartments for the clerks to sleep in, as they are necessarily up early to receive the mails.

As the business of this office must be performed in the space of two or three hours in the morning, and the same period in the evening, it demands a regular system for the sorting of so many letters. The average is about 46,000 letters, which arrive at six in the morning, and these are generally counted, examined, charged, and delivered to the letter-carriers by half-past eight or nine o'clock. In the evening the same number is received at the windows, and must be dispatched before eight o'clock. As the greatest number is received just before seven, the greatest expedition is used to complete the whole operation. The letters are first arranged as they arrive from the receiving-houses in different compartments, marked with the name of the mail by which they are to be sent, which is performed by the unior clerks. The senior clerks then mark on each letter he amount of postage, which is done at the rate of one econd of time for each letter, and the letters are placed n boxes labelled with the names of the towns. The reeiving-office is closed at seven o'clock, when the letters or each town are summed up, and the summation put in he bag with them. Letters may be sent later than seven, y paying a fee, which is allowed as a perquisite to the unior clerks. The bags of letters are tied, sealed, and devered to the several guards at eight o'clock.

The delivering of the letters in the morning is expedited by means of *accelerators* or light-built carriages first used when the new building was occupied. A postman, or rather coachman, in these takes different divisions of the town, and drops the letter-carriers, with the letters, in their various walks, which saves the difference of time between walking and riding, and produces a most expeditious delivery in the most distant parts of the metropolis. The inland office employs about 200 clerks and sorters, and about the same number of persons for the delivery of letters. The foreign office has twenty clerks, and thirty-four for the delivery. The two-penny post employs about fifty persons.

An Account, shewing the Produce of the Post-Office Revenue, together with the Charges of Collection, in each year from 1820 *to* 1834, *both inclusive.*

Year.	Gross Receipt.	Returned Letters and Overcharges.	Net Receipt.	Charges of Collection.	Net Revenue.
1820,	L. 2,144,678	L. 76,616	L. 2,068,061	L.588,514	L. 1,479,547
1821,	2,119,431	77,336	2,042,095	617,056	1,425,039
1822,	2,128,926	73,594	2,055,331	594,082	1,461,249
1823,	2,154,294	76,311	2,077,983	569,117	1,508,866
1824,	2,262,814	79,267	2,183,547	594,874	1,670,219
1825,	2,367,567	91,360	2,276,207	605,988	1,624,256
1826,	2,392,272	87,469	2,304,802	680,546	1,501,056
1827,	2,278,412	83,663	2,194,749	693,692	1,544,223
1828,	2,287,961	79,962	2,207,998	663,774	1,588,672
1829,	2,265,482	80,815	2,184,667	675,319	1,509,347
1830,	2,301,432	89,226	2,212,206	694,254	1,517,952
1831,	2,321,311	93,947	2,227,364	658,325	1,569,038
1832,	2,277,274	101,983	2,175,291	643,464	1,531,826
1833,	2,294,911	104,729	2,190,181	636,755	1,553,425
1834,	2,210,830	110,541	2,100,299	650,962	1,449,337

As the post-office is peculiarly a department of expendire as well as of revenue, much care and attention is apied in making the contracts with those who convey the ails, and great economy in adjusting the appropriate saries to the different officers. This is clear from the numer of persons employed under the postmaster-general, being more than 3000, with from 4000 to 5000 horses, and near 200 coaches. The packet service costs L.115,000 yearly; the mileage to mail-coaches, and the payments to guards, tolls, &c. amount to about L.72,000; and the expense of conveying letters to Nova Scotia, Canada, and Jamaica, to which parts the packets do not go, costs L.12,500.

An Account of the Amount of Postage collected at the principal Cities and Towns of the United Kingdom, in the years ending the 5th January 1833, 1834, *and* 1835.

Places.	1833.	1834.	1835.	Places.	1833.	1834.	1835.
ENGLAND.				SCOTLAND.			
London,........	L.632,696	L.642,871	L.660,417	Aberdeen,......	L. 8,660	L. 8,479	L.8,596
Birmingham,..	28,685	28,812	29,258	Edinburgh,....	42,759	41,864	41,680
Bristol,..........	33,884	33,242	33,210	Dundee,........	7,367	7,904	8,162
Coventry,......	4,446	4,357	4,421	Glasgow,.......	36,053	36,481	36,483
Hull,............	14,607	14,853	14,859	IRELAND.			
Leeds,..........	20,316	21,331	20,316	Dublin,..........	80,611	69,096	70,344
Leicester,......	6,464	6,439	6,464	Belfast,..........	9,747	9,457	10,312
Liverpool,......	70,011	74,080	70,111	Cork,............	11,557	11,721	12,516
Macclesfield,..	2,064	1,955	2,054	Limerick,......	6,380	6,357	6,967
Manchester,...	53,510	56,287	60,621	Drogheda,.....	1,932	1,935	2,040
Norwich,.......	10,004	9,766	10,004	Londonderry,.	3,479	3,510	3,654
Nottingham,...	9,033	9,368	9,033	Waterford,.....	5,383	5,361	3,339
Potteries,.......	6,714	6,858	6,714				
Preston,........	5,200	5,190	5,146				
Sheffield,.......	11,027	11,582	11,759				

The *Mint*, on Towerhill, is a simple, elegant, and extense building, erected within a few years, under the directn of that eminent architect, Smirke. It consists of three sreys, having a centre ornamented with columns, and a pdiment displaying the British arms, and two wings with pasters. Within the enclosure is a house for the master, ad accommodation for the other officers of the establishment. The interior is appropriately arranged for the manfactory of coined money, all of which is executed by the best machinery, invented by Bolton, with some recent improvements. The whole is put in motion by a steam-engine, and lighted by gas, and is capable, in case of need, of coining a vast quantity of coin in an almost incredibly short space of time. Strangers are only admitted to see it upon some special recommendation of the superior.

The amount of gold and silver money coined here in the last seventeen years has been as follows:—

Year.	Gold.	Silver.	Total.
1818,	L. 2,862,373	L. 576,279	L. 3,438,652
1819,	3,574	1,267,272	1,270,847
1820,	949,516	847,717	1,797,233
1821,	9,520,758	483,686	9,954,444
1822,	5,356,787	31,430	5,388,217
1823,	759,748	285,271	1,045,020
1824,	4,065,075	282,070	4,347,145
1825,	4,580,919	417,535	4,998,454
1826,	5,896,461	608,605	6,505,067
1827,	2,512,636	33,019	2,545,656
1828,	1,008,559	16,288	1,024,847
1829,	2,446,754	108,259	2,555,014
1830,	2,387,881	151	2,388,032
1831,	587,949	33,696	621,646
1832,	3,730,757	145	3,730,902
1833,	1,225,269	145	1,225,414
1834,	66,946	432,775	499,721

Excise Office.

In Broad Street is the *Excise Office.* It was originally the property of that eminent merchant Sir Thomas Gresham, and is remarkable as being the spot upon which the Royal Society was founded. It was begun here from Wilkins, afterwards Bishop of Chester, having apartments in it, at which, in 1658, meetings were held of scientific men, consisting of Dr Ward, afterwards Bishop of Salisbury, the great and good Mr Boyle, Sir William Petty, Doctors Wallis, Goddard, Willis, and Bathurst, and Sir Christopher Wren, with a few more. Such were the founders of that society which has done so much for the promotion and diffusion of scientific knowledge, and whose fame is only bounded by the limits of the civilized world. It 1711, it was removed from this place to Crane Court, Fleet Street, and thence to the present apartments in Somerset House. Gresham House was, after the great fire, converted into alms-houses, which were sold to government in 1763, and on the spot was built that extensive structure now used by the commissioners of the excise branch of the public revenue. It is a capacious edifice, consisting of two ranges of building, separated by a court-yard, and connected by a passage through it with Bishopsgate Street. It is well arranged in the interior for the dispatch of business, which greatly facilitates that regularity, expedition, and security which peculiarly distinguish that portion of the public service.

Trinity House.

An institution, which has proved of vast benefit to the art of navigation, has its chief establishment on Tower Hill, and is called the *Trinity-House.* This society was founded in 1515, when the British navy first assumed a systematical form, by Sir Thomas Sport, who was comptroller of the navy, and commander of the great ship *Henry Grace de Dieu.* It was first established at Deptford, Strand, under the name of "the Master, Wardens, and Assistants of the Guild or Fraternity of the most glorious and undivided Trinity." In process of time it has acquired large property, and the members being chosen partly from the highest ranks, but chiefly from men of skill in the naval profession, it is a body highly respectable and useful. Its members are frequently seated with the judges on the bench to assist by their advice in maritime affairs. They examine and nominate pilots, superintend the light-houses, buoys, and land-marks, regulate in London the ballasting of ships, examine the masters of his Majesty's ships of war, and superintend the mathematical studies of the youth of Christ's Hospital. The corporation now consists of a master, four wardens, eight assistants, and eighteen elder brethren; and though they retain the old house at Deptford, where they have an hospital for decayed masters of ships and their wives, they hold their chief sittings at their new house. As they are the guardians of many charitable funds, they yearly relieve the distress of numerous poor seamen and their families. Their elegant house was built in 1793 by Wyatt. It is of Portland stone, with a rustic basement, over which is one storey adorned with Ionic columns and pilasters. In it are many portraits of eminent naval men, particularly of the celebrated Admiral Sir John Leake, who distinguished himself at the battle of La Hogue, and captured Gibraltar, Carthagena, and Minorca, in the reign of Queen Anne. There are also preserved captured flags and other naval trophies.

Distribution of articles of foreign commerc

Hitherto attention has been directed to the commerce of the metropolis, and the institutions connected with that part of it, which is carried on by maritime means. It will now be proper to notice the distribution of the various articles which foreign commerce conveys to London. It has already been observed, that the intervention of brokers is had recourse to in mercantile transactions; but between the merchants and consumers, there are other classes of traders who constitute an important part of the inhabitants of the metropolis. This may be best described by taking some prominent article of commerce, and attending to its distribution; and as sugar is one of the largest amount of any commodity brought by sea, it is best adapted to the purpose we have in view. The West India merchants import it by ship-loads, but in the ships are various qualities, according to the plantations which produce it. Upon their landing, samples are exhibited of the different qualities, classed according to their value, upon boards by the brokers. The wholesale grocers purchase the sugars by boards of ten, twenty, or forty hogsheads at a time, and then sell them to the retail grocers, whose demand is limited, by single hogsheads, or by portions of hogsheads. The profit of the intermediate wholesale grocers is generally small, but as the amount is large, and the return quick, it is generally a lucrative trade. It facilitates the great operations of the importing merchant, and accommodates the condition of the retailer, and these middlemen or wholesale grocers being generally possessed of large capitals, buy with ready money, and sell on credit, which, though short, is of great service to the retailers, who are commonly less provided with capital. If the wholesale grocer can return his capital three or four times in the year, with but a profit of two per cent. beyond the interest, he is amply repaid for the use of his capital, and the increase of his profit is scarcely felt by the consumer. It is not necessary here to entertain the question, whether it would not be better for a community that all transactions in commerce should be conducted solely by ready money; our object being rather to shew the existing mode, than to indulge speculations on a supposititious arrangement under a different state of affairs.

The other great articles of commerce are distributed in the same manner as sugar. Thus tea is bought at the India House by the wholesale tea-dealers in lots of several chests, and sold by them to the retailers in single chests, or part of chests; so are currants, raisins, figs, coffee, spices, rice, and in a great degree wine, rum, brandy, and gin. There are, indeed, a few in each branch of trade who are both wholesale and retail traders; but they form the exceptions, not the rule.

In a similar way the wholesale traders of the metropolis become the channels for conveying the articles manufactured in one part of the kingdom to the retailers, and the latter to the consumers in the other parts of it. Thus wholesale houses in London collect the cloths of Yorkshire; the stuffs of Norwich; the cottons of Lancashire or Scotland; the linens of Ireland, or of the northern counties; the iron-ware of Birmingham; the cutlery of Sheffield; the pottery and porcelain of Staffordshire; the bottles of Northumberland; the ribbons of Coventry and Leake; and the hosiery of Nottingham, Leicester, and Derby; and from their warehouses, by the assistance of their travellers, they supply the chief demand of the shopkeepers in the smaller towns in the southern and western counties of England.

Thus London, from the capital possessed by its merchants, its easy accessibility from every part of the kingdom, and the facilities of direct conveyance to and from it, has become a trading place far beyond what its own production and consumption could ever have created. The system of banking pursued in London is peculiarly favourable to the interest and the convenience of the intermediate trade. There are seventy private banking houses in the city and its adjuncts; most of the traders keep accounts in them; and the surplus money of some accounts is used to discount bills for those who need it, whilst acceptances for goods sold, the practice of giving which has vastly increased, can easily be converted into money. The bankers can spare a greater portion of their balances than they could do if they were liable to general calls for it; but that is not much the case, from the establishment created among the bankers called the clearing-house. At that place, near Lombard Street, each banking house sends a clerk with the checks on other houses received in the course of the day, and there exchanges them with the checks drawn upon them. By this exchange of paper, sums of enormous magnitude are paid and received mutually, with the use of only a small sum of money, or of Bank of England notes. In fact, in London, generally speaking, there is much less money left in a state of absolute rest, than in proportion to its amount is to be found in any other of the commercial cities of Europe.

The ease and certainty with which assorted cargoes for ships bound to foreign markets can be furnished is a great advantage to London, and particularly to that intermediate class of traders called warehousemen or wholesale dealers. There is no product of any part of the United Kingdom, none of those of the most distant parts of the globe, that may not be obtained in London, without causing any detention to the departing vessels, and without any great advance in the price beyond the cost of conveyance.

Although London, when compared with some of the towns of the north of England and of Scotland, can scarcely be entitled to the name of a manufacturing place; yet the various articles fabricated in and around it, afford great occupation to numerous individuals; and they have been the nurseries in which the most important branches of national industry have received their birth and their first growth. The silk trade is that which at present gives employment to the greatest number of hands. This was originally introduced by French Protestant refugees, many of the descendants of whom still continue the trade of their ancestors. The number of persons employed in the several operations of dyeing, winding, warping, and weaving silk, a large proportion of whom consists of females and children, is estimated at 48,000. The new-fashioned goods and the fancy articles are mostly made here; and any kind of goods that happens afterwards to become much in demand, is soon made, where food, fuel, and labour are cheap, upon which it ceases in London. The change of fashion and the variation of taste is so frequent, that the silk-weavers do not decline in the metropolis, notwithstanding the numerous power-looms which make silk goods in the other parts of the kingdom. The good effects of the nurture which the metropolis affords to infant fabrics, may be illustrated by some facts relating to the silk trade. In the middle of the last century, silk gauzes were exclusively made in London. But some disturbances amongst the weavers, caused a family or two whose property was embarked in that business to remove to Scotland in the beginning of the reign of George III. They there established the silk gauze trade, employing operative weavers, who had been occupied in making gauzes of flax, commonly known by the name of Scotch lawns or clear lawns. The attempt succeeded, and soon became so extensive that the great and flourishing town of Paisley owes its present state to this circumstance. The effect of this early nurture of the trade did not stop with itself. In a few years, the fashion of wearing silk began to decline, and the experiment was tried to turn the hands who had woven silk gauzes to the kindred manufactory of muslins like gauze, but made of cotton. Book muslins, as they were called, and afterwards other sorts of muslin, were then fabricated: a trade on the extent and value of which to the whole kingdom it is unnecessary here to expatiate.

There are numerous small articles which are either made exclusively in London, or which, having the name of "town made," are better reputed than any others. Amongst the first are silk fringes, coach lace, gold and silver lace, lapidary articles, Prussian blue, and some others; amongst the latter, as is well known to all ladies, are needles, pins, fine scissors, and penknives, to which may be added musical, mathematical, and surgical instruments; brushes, combs; clocks, watches, jewellery of the superior kinds, gold and silver plate; ornamental and useful furniture, coaches and other carriages, saddlery, painters' and dyers' materials; numerous medicinal and chemical preparations, particularly magnesia, aquafortis, sal-volatile, essential oils, and other articles.

Trades.

The publication of books is a great trade in London. The population return of trades is necessarily indistinct; but, according to it, there are 8950 males above twenty years of age, who are booksellers, printers, binders, or otherwise employed. It gives subsistence to about 50,000 individuals. The tailors and shoemakers furnish with their respective articles of dress many who do not reside in London, and many even in the colonies and in India. The numbers of the tailors are stated at 13,783. Those of the shoemakers and menders amount to 15,274; but the chief part of the shoes furnished to London are made at Stafford, Northampton, and Newcastle-under-Line. The bakers are stated at 5209; the butchers at 4069; the carpenters, 12,254; the cabinet-makers, 4921; the publicans, 4804; the upholsterers, 1724; the glaziers and plumbers, 2272; the bricklayers, 4874; the house-painters, 4439; the blacksmiths, 4106; the whitesmiths, 1822; plasterers, 1725; and the stone masons, 1592.

As these numbers relate solely to males above twenty years of age, they can only be used for the purpose of comparison; but as females are excluded, and all males below twenty, we may perhaps be justified in assuming that the number of individuals subsisting by means of these professions may be multiplied by four.

It is obvious to remark the great number of persons employed in the construction or reparation of buildings, and the proportion they bear to those engaged in other kinds of industry. This seems to show that the metropolis is still most rapidly advancing in improvement, as it must be in wealth, since the erection of new houses of any kind is the best evidence of a previous accumulation of capital.

Quantity of provisions consumed.

The next object of attention is the quantity of provisions consumed in London annually, and the means by which supplies are procured. The annual supply of cattle, in the last ten years, has been 153,228; that of sheep, 1,265,958; that of fatted calves, 20,780. The pigs are estimated, but little faith can be placed in the calculation, as one-tenth of the number of sheep. If the weight of the cattle be taken at 300 lbs. on the average, and the offal be taken at 200 lbs., the weekly amount consumed will be 1,766,092 lbs. If, in the same way, the weight of the sheep be taken on the average at 80 lbs. each, and the offal at 20 lbs., the weekly weight consumed will be 2,035,788 lbs. The calves, averaging 140 lbs., with 35 lbs. allowed for offal, would give a result of 61,191 lbs.

Thus, taking the whole into view, the weight appears to be:—

Of beef, . . .	1,766,092 lbs.
Of mutton, . . .	2,035,788 ...
Of veal, ...	61,191 ...
To this may be added for pork, one-twentieth the weight of mutton, .	101,787 ...
	3,964,858 lbs.
There is also brought to London a large quantity of bacon hams, tongues, and other salted meat. A portion also of the offal, as tripe, liver, and other parts, is used as human food, and so are sausages. These may be estimated as equal to one-tenth, or .	396,485 lbs.
	4,361,343 lbs.

We thus arrive at a weekly consumption of 4,361,342 lbs., or to a daily consumption of 623,049 lbs., being, for 1,800,000 persons, 5½ ounces per day, or 109 lbs. yearly. The statistical accounts of Paris give, as the annual consumption of each person in that city, 86 lbs.; and at Brussels the estimate is three pounds higher, or 89 lbs. In no other city of Europe, excepting perhaps Hamburg, does the consumption reach so high as in Paris.

The preceding remarks on animal food are only made for the sake of comparison, and not to obtain great confidence. The only actually ascertained facts are the numbers of the oxen and sheep, all the rest being estimate or conjecture. It is well known that cattle are purchased at Smithfield, and driven to the towns near London to be slaughtered, and that many cutting butchers in such towns buy cattle of the carcass butchers in London. From many distant towns much meat is sent to the metropolis, when cut into joints. The legs with the loins of sheep, and the best parts of the roasting pieces of beef, are sent by coaches to the butchers of London, and the inferior parts of the same animals are sold in the country markets. All this makes any calculation, whatever foresight may be applied to the subject, very uncertain and doubtful. The weekly account of sales here quoted only applies to the animals brought to Smithfield, of which an account is taken by the city authorities. The sales have not increased with the increase of the population, and chiefly because other markets recently rising, the amount of sales in them has increased. One of these is at Southall, on the Uxbridge road; another at Balls Pond, Islington; and one near Croydon. Of these no accurate account can be obtained.

Quantity of corn consumed.

The quantity of corn consumed in London is as difficult to be ascertained as that of meat. The market of Mark Lane, where, in two buildings of handsome appearance and commodiously fitted up, the principal transactions in grain and flour are conducted, is no criterion of the quantity actually consumed. There are speculations at times going on, which baffle all conjecture. Besides, much of the bread made in London is compounded of flour brought by sea from the northern parts of England, and some even from Scotland and Ireland. Most of the mills which supply the best flour are either in the vicinity of London, or at such a distance that a waggon and horses can go and return within the day. On the river Colne, from Walford to the Thames, are several powerful mills. On the river Wandle, in Surrey, are also some; and there is one enormous mill at Wandsworth, partly worked by steam. The Thames below London conveys to it much corn and flour; the best of both is brought from the shores of Kent and Essex; but much comes from the more distant ports in the counties of Suffolk, Norfolk, and Lincolnshire. The supply of oats is chiefly obtained from Lincolnshire and the rich marshes of the Isle of Ely, which export at Wisbeach or Lynn. Barley is generally supplied from the turnip farms of Norfolk, and from the lands of the lighter kinds in Cambridgeshire, Hertfordshire, and Bedfordshire; but much of it is made into malt before it is sent to London. According to the accounts of the inspector of corn returns, the quantity sold in London has been as follows.

An account of the quantities of British Wheat, Barley, and Oats, sold in the London markets in each year from 1825 *to* 1835, *both years inclusive.*

Year.	Wheat.	Barley.	Oats.
	Qrs.	Qrs.	Qrs.
1825	317,875	239,676	572,640
1826	240,920	161,124	391,386
1827	232,202	156,629	279,204
1828	287,209	201,533	1,064,000
1829	156,770	183,256	1,077,326
1830	214,032	247,015	772,405
1831	222,514	218,460	867,463
1832	362,495	271,107	1,165,737
1833	373,730	325,508	1,067,314
1834	409,241	311,962	1,123,593
1835	381,188	258,744	1,247,975

Supply of fish.

London is well supplied with fish of all kinds, according to the season. The greater part is brought by vessels to the wholesale fish-market at Billingsgate, in Lower Thames Street. Many of these vessels are Dutch, which catch the fish, chiefly turbot, on the Dogger Bank, and convey it to market; but much is taken by our own fishermen. From Scotland, abundance of salmon, in the proper months, is brought to Billingsgate, packed in ice. In some years there have been imported from Norway as many as 1,200,000 lobsters, and some from Heligoland. There is no duty upon turbot or lobsters, but all other fish, if not caught by British fishermen, are prohibited. At some periods great quantities of fish, chiefly mackerel, are brought to London by land-carriage. Large quantities of cured fish are furnished to the metropolis, such as the salted cod brought from Newfoundland, the smoked and the salted herrings caught in Scotland, and on the shores of Norfolk and Suffolk. The fish trade still centres in the city at the old market of Billingsgate, an attempt to establish a market of competition at Hungerford having hitherto failed. The trade is carried on chiefly by means of salesmen, who contract for the cargoes as they arrive, and retail them out to the fishmongers, of whom there are 950 scattered about in every division of the metropolis and the contiguous villages. The oyster fishery depends chiefly on the demand in the metropolis, where only the best can be obtained. The feeding of them is carried on chiefly at Colchester, to which neighbourhood they are brought from the shores of Hampshire and Dorsetshire, and laid down in beds on creeks, to grow and fatten during two or three years. The trade employs about 200 vessels of from fifteen to forty-five tons burden. The quantity caught of late years has been from 14,000 to 15,000 bushels. The packing them in small barrels as presents, is a considerable trade. The quantity of fish brought to London has been estimated at 50,000 tons weight annually, but with what degree of correctness this is stated, we have not ascertained.

Products of the land around London.

The land around London is much too valuable to be destined for the growth of corn. Whatever may have been the original quality of the soil (and it was probably once very poor), the draining in the swampy parts, and the vast quantity of manure which a great city supplies, has made it some of the most productive in the kingdom. It is, however, chiefly devoted to feeding cows, whose milk must be brought fresh to the consumer, or in growing such delicate fruits and vegetables as are injured by long keeping or long carriage. The number of cows kept for milking is

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calculated at about 12,000, yielding about 10,000 gallons of milk, which is supplied at each house twice a-day out of tin pails. The grass-land is hardly sufficient to feed that number, and some part of their food, besides hay, consists of grains from breweries, and often of Swedish turnips or mangel wurzel, brought from farms at a distance.

Except this feeding land, the greater part of the soil is appropriated to nurseries or horticulture. The first yields flowers in abundance, and young plants of the various kinds proper for gardens. The latter produce the best of culinary vegetables that are required for daily use in the metropolis. The more delicate kinds used for salads are eminently good. The lettuces, especially, are more approved than any grown at a distance from London. Cabbages, broccoli, cauliflowers, and other plants of the Brassica tribe, are deemed to be more appropriate products of the soil and atmosphere of the vicinity of London, than of any other parts of the kingdom.

Those fruits which are of the most perishable kind are grown nearest to London, particularly raspberries, strawberries, and cherries in their season. These are commonly gathered at a very early hour in the morning, and sent to the first-rate fruit shops, on the heads of women, mostly from Wales, and are ready quite fresh at the hour of breakfast. Gooseberries, currants, and the common wall-fruits are amply supplied. The vegetables from Chelsea, Hammersmith, Fulham, and on the banks of the river are conveyed for the most part by the river Thames, and consigned to Covent Garden and the other vegetable markets, where they are met with those products that arrive in carts. They are generally sold by salesmen or factors, and then distributed throughout the metropolis by a class of small traders denominated green-grocers.

The more common and less perishable vegetables, such as potatoes, turnips, carrots, and parsnips, are grown at a greater distance, but are brought to the same markets, and are dispensed to the consumers in a similar manner. It may here be remarked, that the vicinity of Gravesend is celebrated for the excellence of its asparagus and artichokes, the greater part of which is conveyed to London by the steam vessels. Not far from that place is a kind of farm which could be profitable nowhere but in the vicinity of a great city. A few acres are destined to grow watercresses. These are gathered early every morning, bound up in small bunches, and despatched by a light cart to London, where it arrives by the hour of breakfast, and is distributed by persons who cry them through the streets for sale. Poultry is abundantly if not cheaply provided; but if dear, it is remarkably good. Higglers travel the country round London and purchase fowls in the lean state. These are carefully fattened at some large establishment for that purpose in the eastern side of London. Pigeons are also kept for poulterers' shops, and many tame rabbits. Of late hares, pheasants, and partridges have been allowed to be sold, and are obtained at moderate prices. These articles furnish subsistence to about 350 traders, known by the name of poulterers, who sometimes unite with them the dealing in butter, eggs, and sausages.

kets.

The markets in the metropolis are numerous, but the most considerable of these can here receive no other attention than mentioning their names and localities.

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Covent-Garden has been already noticed as the place for vegetables. It is the centre of a square, and has been newly built within the last six years by the Duke of Bedford, the proprietor. It is an elegant and commodious structure, with two ranges of shops running from north to south, and three from north to south. In these and in the open parts of the market the display of fruits, flowers, and vegetables, especially at an early hour of the morning, is a very gratifying spectacle. Its situation is convenient, and the access to it from every side peculiarly easy.

London.

Newgate.

Newgate market is one of the largest, dealing much by wholesale both in meat and vegetables. There are many carcass butchers who sell the whole animals when slaughtered, without the skin, tallow, and entrails, to others in the same market, or in other parts of the town, who sell it by the joint, and are distinguished by the name of cutting butchers. There are also salesmen as well as retailers of fruit and vegetables. The great or wholesale markets are on Monday, Wednesday, and Friday.

Leadenhall.

Leadenhall market rivals that of Newgate in the number and extent of the carcass and cutting butchers, and excels it in the trade of skins and leather. A new market called Farringdon has been constructed to supply the want of Fleet market, which has been removed to form a good avenue. It is large, covering more than an acre of ground, and the building, which was finished in 1829, cost the corporation of the city L.200,000. It is very commodious, but hitherto not filled with sellers and buyers.

Hungerford.

Hungerford market has been built only two years, on the site, but enlarged, of a former market. It is an elegant and commodious structure, most appropriately fitted up. As it stands on the bank of the Thames, and has convenient access to the water by stairs, it was expected that the vessels with fish would come up and discharge them; but that expectation has not been fulfilled, nor are the greater part of the shops occupied. It was built by a joint stock company. The length of the interior is 140 feet, and the breadth 70. The front to the river has a fine appearance.

Other markets.

The great markets for hay and straw are held in Whitechapel, in Smithfield, in the Borough, in the Haymarket, and near the Paddington canal. The other markets are Newport for butcher-meat, Borough for meat and vegetables, and Honey Lane for the best qualities of their several kinds of food; Clare, Cumberland, Fitzroy, Grosvenor, Hoxton, James, Oxford, Red Lion, Mortimer, Tottenham Court, St Luke's, St George's, Shadwell, Sheppard's, Brooks, and Chelsea, are all of them markets upon a retail scale, but sufficiently supplied to accommodate the population in their immediate vicinity with what they require.

The class of tradesmen called cheesemongers, of which there are 1395 in the metropolis, deal chiefly but not all of them exclusively in butter and cheese. Some of them add to their proper trade that of selling hams, bacon, and tongues. The sale of butter is said to be 24,650 pounds, and that of cheese to be 26,700,000; but this must at best be a doubtful estimate.

The mode by which the poorest classes are supplied with food, according to the power of purchasing it, is by small shops scattered through every part of the outskirts of the town. In some of these, small portions of meat, or of puddings, or of vegetables may be obtained ready cooked, at very low rates. In some parts these are in cellars, which are the most homely and cheapest. Of late a practice has prevailed of carrying about potatoes ready boiled, and kept warm, which are sold to the most destitute, who can only command a penny or even a halfpenny, and with that can purchase a meal, though a very scanty one.

Water companies.

No city can become large unless it is built on the banks of a river which abundantly supplies it with water both for drinking and for cleanliness; and when it becomes extended far from the river, the expense and the labour to be applied to afford a supply of water to such parts is very great, especially if, as is almost always the case, the ground rises in height as it is more removed from the stream. Although London is supplied with many excellent springs of fresh water, they were early found to afford an insufficient supply, and, besides, the water was not fitted for many purposes. Various means have been adopted to secure an adequate portion of water, each of which deserves notice; but the most prominent is that which still affords nearly one-half the quantity that is consumed.

In the early part of the reign of James I., Sir Hugh Middleton, a citizen of the Goldsmith Company of London, undertook at his own risk and charge to convey to the elevated hill above the city a river of fresh and good water. He began the work in 1608, but the city refusing to embark in the undertaking, the King covenanted to advance money for the purpose on condition of half the property being conveyed to him. This agreement was made in May 1612, and in September 1613 the water was let into the basin at the place now called the New River head at Islington. From thence by subsequent labour it was at length conveyed by pipes underground to the several streets and houses that required it. Since that period the company has augmented its supply first from the river Lea and then from other sources; and the concern has proved highly beneficial to the company. The principal supply is obtained at Amwell in the county of Hertford, whence preserving the level so as to have only a fall of two inches in a mile, it flows forty miles with a gentle motion, and in that distance passes under 200 bridges, until it reaches the main large or circular reservoir whence it is distributed to the inhabitants.

The next attempt to supply water was by the Chelsea Water-work Company in the year 1723; and these two, with some aid from machinery at London Bridge, continued to supply the north side of the Thames till 1810, when three new companies, the East London, the West London, and the Grand Junction, were established by authority of different acts of Parliament.

The following account from Wade on the Police will best describe the operations and practical effects of the companies. The progress of the New River has been noticed. There are at Clerkenwell two reservoirs having between them a surface of about five acres and a depth of ten feet. These reservoirs are 84½ feet above low water-mark in the Thames. and by means of steam-engines and a stand-pipe an additional height of sixty feet can be given to the water; so that all the mains belonging to this company are kept full by a considerable pressure of water. The highest service given by the New River is the cistern on the top of Covent Garden theatre. The aqueduct by which the water is brought has only a fall of two inches in a mile; thus it wastes by evaporation in summer, and is impeded by frosts in the winter. At such times the company pump an additional supply from the Thames at Broken Wharf, between Blackfriars and Southwark Bridges. To this, however, they seldom have recourse, and their engine, erected since the works at London Bridge have been removed, has worked only 176 hours in the year. The New River Company supply 66,000 houses with water at an annual average of 1100 hogsheads each, or, in all, about 75,000,000 hogsheads annually.

The East London water-works are situated at Old Ford, on the river Lea, about three miles from the Thames, and a little below the point to which the tide flows. By the act of parliament this company must take its water when the tide runs up, and the mills below have ceased working. The water is pumped into reservoirs, and allowed to settle, and a supply of 6,000,000 gallons is daily distributed to about 42,000 houses. This company supplies no water at a greater elevation than thirty feet, and the usual height at which the delivery is made to the tenants is six feet above the pavement. They have 200 miles of iron-pipes, which, in some places, cost them seven guineas the yard. This and the New River are the only companies that do not draw their supply wholly from the Thames.

The West Middlesex Company derive their supply of water from the Thames at the upper end of Hammersmith, 9½ miles above London Bridge, where the bed of the Thames is gravel. The water is forced by engines to a reservoir at Kensington, 309 feet long, 123 wide, and 20 deep, which is paved and lined with brick, and is elevated 120 feet above low water in the Thames. They have another reservoir on Little Primrose Hill, about 70 feet higher, and containing 88,000 hogsheads of water, under the pressure of which the drains are kept charged in the event of fires. They serve about 15,000 tenants, and the average daily supply is 2,250,000 gallons.

The Chelsea water-works derive their supply from the Thames about a quarter of a mile east from Chelsea Hospital, and they have two reservoirs; one in the Green Park near to Piccadilly, and another in Hyde Park near to Mount Street, the former having an elevation of 44, and the latter of 70 feet. These reservoirs till very recently had never been cleaned, nor had any preparation been made for that purpose in their construction. About one-third of the water served out by this company is allowed to settle in these reservoirs, and the remaining two-thirds are sent directly from the Thames. This company has recently constructed works by which they can filter their water by passing through successive beds of stone and sand before it is sent to the reservoirs. The Chelsea Company serves about 12,400 houses, and their daily supply amounts to 1,760,000 gallons.

The Grand Junction Company derive the whole of their supply from the Thames immediately adjoining Chelsea Hospital, whence it is pumped without any filtration or settling into three reservoirs at Paddington. These are respectively about 71, 86, and 92 feet above high water-mark in the Thames; their united contents are 19,355,840 gallons; and by means of a stand-pipe the water is forced to the height of 147 feet, or about 61 feet above the average height in the reservoir. The number of houses supplied by the Grand Junction Company is 7,700, and the average daily supply of water is 2,800,000 gallons.

The Lambeth Company take their supply from the Thames between Westminster and Waterloo Bridges. It is drawn from the bed of the river by a suction-pipe, and is delivered to the tenants without being allowed to subside, there being only a cistern of 400 barrels at the works, as a temporary supply till engines can be started. The greatest height to which the company force water is about 40 feet.

The South London or Vauxhall Company take their supply from the river Thames by a tunnel which is laid six feet below low water-mark, and as far into the river as the third arch of Vauxhall Bridge. At that particular place the bed of the river is described as being always clean, and without any of those depositions of mud and more offensive substances that are found in many other places. Besides the greater purity of the bed of the Thames there than where any of the companies on the south side take their supply, the company allow the water to settle in reservoirs. This company supplies about 10,000 houses with water at the rate of 1,000,000 gallons daily.

The Southwark water-works are the property of one individual. They are supplied from the middle of the Thames below Southwark and London Bridges; and the water thus taken is sent out to tenants without standing to settle, or without any filtration further than it receives from passing through grates of wire or small holes in metallic plates. The number of houses supplied from these works is about 7,000, and the daily supply of water about 720,000 gallons.

The supply in a tabular form is thus :—

Companies.	Houses.	Average per day.	Average per Year.	Average per House.
New River,	67,000	13,000,000	4,056,000,000	182
East London,	42,000	6,000,000	1,872,000,000	143
West Middlesex,	15,000	2,250,000	702,000,000	150
Chelsea,	12,400	1,760,000	549,120,000	142
Grand Junction,	7,700	2,800,000	873,600,000	365
Lambeth,	16,000	1,244,000	388,128,000	77
South London,	10,000	1,000,000	312,000,000	100
Southwark,	7,000	720,000	224,540,000	102

The three last companies, which all supply the south side of the river, will appear to have a far less average supply than the others on the north side. This arises from the difference in the size of the houses and the number of inhabitants. Thus the Grand Junction, which supplies the houses of rich districts, contributes near five times as much water per house as Lambeth, which is one of the poorest.

In consequence of the companies taking the water from the Thames within the limits to which the tide flows, it is necessarily, in the first instance, loaded with many impurities. The reports that were recently circulated relative to the deleterious quality of the water have been shewn to be very greatly exaggerated. The statement of Dr Bostock, given in the report of the commissioners, shews that by far the greater part of the impurities in the Thames water are mechanically suspended in, and not chemically combined with it; that they may be separated from it by filtration, or by merely allowing it to stand at rest. Most of the companies have recently made considerable efforts to improve their water; and though they may not have done as much as they might and ought to have done, a considerable improvement has been effected, and there is not the slightest foundation for the notion that the impurities of the water have ever been such as to affect in any degree the health of the inhabitants.

The beverage next to water in importance is the porter of London, a malt liquor much celebrated in every part of the world. Its flavour has been attributed to some peculiar properties in the water from which it is manufactured; but as some of it is made from Thames water, some from New River water, and some from natural springs within the premises of the brewers, that cannot be the cause. The breweries are generally very large establishments, with vessels of all kinds of most incredible capacity; and the malt as well as the liquor is conveyed from one part of the premises to another by machinery set in motion by steam power. The capitals invested in many of the large breweries are enormous; for not only do the cattle, drays, vessels, and premises employ much, but most of them have numerous public-houses either by purchase or on leases, and the occupants placed in them are bound to take the beer from the houses to which the premises belong. There are some persons keeping public-houses who brew their own beer, but their number does not much exceed twenty, and their operations are necessarily on a contracted scale. In 1831, the number of males above twenty years of age who are occupied in brewing appears by the parliamentary returns to have been 563; but this is a very indeterminate mode of viewing the extent of the trade.

Before the alteration of the law by which the tax on beer was taken off, the books of the excise office afforded exact accounts of the quantities of beer annually brewed, but now it is difficult to collect any facts with accuracy. In the year 1830, the quantity brewed, in barrels of thirty-six gallons, the last of those in which the tax was collected by the ten principal houses in London, was as follows :—

	Barrels.
Barclay & Co.	243,546
Truman, Hanbury, & Co.	178,318
Whitbread & Co.	155,761
Reid & Co.	151,566
Coombe & Co.	104,349
Henry Meux & Co.	83,422
Calvert & Co.	74,418
Taylor & Co.	63,658
Hoane & Co.	59,641
Elliott & Co.	42,827

These supply the chief consumption, the others, though numerous, not producing more than one-fifth of the great houses.

Insurance offices.

One class of public establishments of the most beneficial nature to trade especially, but in a greater or less degree to all other persons, consists of the various Insurance offices in London. These may be divided into three sections, viz. 1st, insurances on property at sea against all risks; 2d, insurances of houses and other goods against losses by fire; and, 3d, insurances on lives.

Marine insurances are chiefly effected at Lloyd's coffee-house, which has been already noticed under the head of Royal Exchange; but there are four joint stock companies who insure against sea risks to a large extent, and who for some descriptions of business are preferred to the underwriters at Lloyd's. Two of these are of ancient establishment, viz. the London Assurance Company, and the Royal Exchange Company. Two others are of more recent foundation, one called the Alliance Marine Assurance Company, and the other the Indemnity Mutual Marine Assurance Company. All of these are of indisputable credit and high honour, and transact a vast deal of business. Besides these there are clubs or associations formed by ship-owners, who agree, each entering his ships for a certain sum, to divide amongst themselves each other's losses. The more public institutions act in some measure in concert with the great mass of underwriters who carry on their operations at large, so far as to contribute to the expense of collecting information respecting the condition and equipment of all shipping in every port, and defraying the general expenses of the committee of Lloyd's.

The business of insuring against fire, and the premiums on the different descriptions of risks, are so well known, that any enumeration of them here seems unnecessary. The offices existing in London, and the amount they have paid for stamps in one year, viz. 1832, are as follow :—

Albion,	£15,011
Alliance,	20,147
Atlas,	21,010
British,	15,644
County,	48,507
Globe,	27,198
Carry forward,	£147,517

Brought forward,	£147,517
Guardian,	31,528
Hand-in-Hand,	10,960
Imperial,	28,234
London,	8,125
Phœnix,	75,076
Protector,	59,182
Royal Exchange,	54,824
Sun,	124,127
Westminster,	15,315
	£554,988

Each of these companies maintain fire-engines and a company of firemen, who, as soon as an alarm is given, hasten to the spot where a fire has broken out, and lend their assistance to extinguish it, and to aid the inhabitants in removing or saving their property. On such occasions they are also found of great service to check the depredations of thieves, who commonly congregate wherever a fire happens.

This business of insurance against fire has led to the establishment of county offices for the purpose in most parts of England; but except that at Norwich, which has a branch in London, and one at Exeter, they do but little business. The stamps of all the others scarcely amount to £100,000.

The business of Life Insurance is one almost exclusively known in England, and chiefly carried on in London; and no other country has adopted the system which has been so successfully pursued by us. The first society of the kind in England was the Amicable, established in 1706. The Royal Exchange and the London Assurance companies began to insure on lives in the latter part of the reign of George I., after which several projects of the kind were started and failed. In the year 1763, the Equitable was first established. This subject engaged the attention of Dr Richard Price, an eminent mathematician, whose judicious suggestions caused that society to obtain a high degree of success, and encouraged others, on his principles, to start the various companies which now exist in the metropolis. The greatest business of all these companies consists in receiving a sum by annual payments, according to the age of the life insured, on condition to pay at the death a given sum. The annual sum is greater or less as the person is younger or older, and regulated by tables of the expectation of life, framed from the most accurate views that have been obtained of the average mass of human mortality. The tables used by most of the companies are those of Carlisle and Northampton, calculated on the proportion of deaths in a given number of persons. Some of these tables having been thought uncertain or erroneous, the government has employed Mr Finlayson, and the companies Mr Milne and other calculators, to render them more perfect, and much assistance has been received from the facts relating to births and deaths by the population reports of Mr Rickman.

Life insurances are effected by different companies on various principles. One class receives a fixed annual premium, and pays a fixed sum when death occurs, and the proprietors themselves receive whatever benefits may accrue. The Pelican belongs to this class. Others divide the whole of the profits equally between the assured, though they may be divided into two sections, such as the Amicable, which distributes the profits among all the assured; whilst the Equitable allows none to participate in the profits, except such as are assured for the whole term of their lives. The third class have a body of proprietors distinct from the assured, and the profit is shared between the two bodies in various proportions, and in various modes. Thus the Crown Company divides two-thirds of the profits amongst the insurers for life. The Economic divides three-fourths of the profits amongst the assured. The Atlas gives the whole, by a septennial division, to those insured above L.100 for the whole of life. The Rock allots to the assured two-thirds of the benefit, and adds one-third to the capital of the proprietors. The others, viz. the Alliance, the Imperial, the Norwich Union, the Atlas, the European, the Guardian, the Hope, the Globe, the Law Life, and the Medical and Clerical, divide the whole profits, but differ much in their various times and manners of applying such profits.

The houses of several of the insurance companies are a great ornament to the streets where they have been erected. The finest of them are the County and Provident, in Regent Street; the Equitable, in New Bridge Street; the Union, in Cornhill; the Globe, in Cornhill; the Albion, in New Bridge Street; the British, in the Strand; the London and the Pelican, in Lombard Street.

Bridges.

The prosperity of London has been much advanced by the Bridges built over the river Thames, and by the facilities of intercourse with the districts to the south of it being thereby facilitated. In ancient times the connexion with those districts was maintained by means of ferries, the property of which belonged to individuals or to societies. Some of these were adapted for foot-passengers, and others for horses, or for other cattle; and the access by the roads leading to the ferries was such as to forbid the general use of wheel-carriages, so that even heavy goods were brought by pack-horses. The land on both sides was of a marshy nature, and the cost of constructing roads was one amongst many obstacles to the erection of bridges. With regard to the six bridges now on the Thames, none of them has any connexion with ancient recollections except London Bridge, to which the first notice will be directed, and then attention will be given to the others, according to the dates of their construction.

London Bridge.

At what period a bridge was built across the Thames, at the spot now occupied by one, cannot be settled. It could not have been before the year 993, when the Danish invader Unlaf sailed up the river as high as Staines; nor later than the year 1016, when Canute the Dane, in besieging London, was impeded in his operations by a fortified bridge, which compelled him to cut a canal on the south side of the river from Rotherhithe to a spot to the west of the city, and thereby complete the investment. The remains of this great work were found in 1694, at the place called Dock-head.

Howe the historian, represents that construction as the work of the monks of St Mary Overy, who not only built the bridge, but kept it in repair. But however that may be, it was built of wood, and was burned in 1136. It was then rebuilt of stone, and commenced in 1176, and it occupied thirty-three years to complete it, having been finished in 1209.

This great work was founded on enormous piles, driven as closely as possible together, and on their tops were laid planks nine inches thick, strongly bolted, on which the base of each pier was placed. Around all were the sterlings to protect the foundation, which so contracted the passage of the water as to form a fall of five feet with the ebb-tide, which caused the loss of thousands of lives between its erection and removal. The length of this vast work was 915 feet, and it had 19 arches of unequal dimensions, and greatly deformed by the sterlings, and by the houses on each side, which overhung it in a most terrific manner. In most places they hid the arches, and nothing appeared but the rude piers. It was narrow, darksome, and dangerous to passengers from the multitude of carriages; arches of strong timber frequently crossed the street, from the tops of the houses, to keep them together, and to prevent them from falling into the river. The houses had shops mostly tenanted by pin and needle makers. According to Fuller, the first needles were made by a Spanish negro in Cheapside, who died without communicating his art; but one Crouse, a German, in the reign of Elizabeth, first taught the English to make them.

ndon. In one part of the building was a drawbridge, which was protected by a strong tower, that served to admit ships, and served on several occasions as a means of defence. On the top of this tower was constantly presented the horrid spectacle of the heads of persons condemned for treason.

The new bridge, which was begun in June 1824, and completed in 1831, is about 200 feet higher up the river than that which it replaced. It is a fine object, projected by the late Mr Rennie, and executed by his sons. It is built of Scotch and Derbyshire granite, and is composed of five elliptical arches, the central one being the finest ever erected. On either side of the ends of the bridge are five flights of steps reaching to the water. The foundation of the whole is laid on piers, which were driven down twenty feet into the stiff blue clay forming the bed of the river, and on their tops are horizontal sleepers, on which the first course of masonry was placed. The whole length of the bridge is 928 feet, the breadth of the water-way 692 feet, the width from the outside of one parapet to that of the other 56 feet, the span of the centre arch 152 feet, that of the arches on each side of it 140 feet, the height above low water-mark 55 feet, and the width of the carriage-way 33½ feet. It is a proud monument of the present age. The money expended in building the bridge amounted to L.542,000, but to this must be added the cost of the approaches, consisting partly of old buildings, and partly of ground, so that the whole cost amounted to L.711,000. Much of this sum has been borrowed upon the security of the estates of the corporation.

min Bridg That noble structure, as it was then denominated, called Westminster Bridge, was begun in January 1739. The first stone was laid by Henry Earl of Pembroke, of whom Walpole reports, that no nobleman had a purer taste in architecture. The design was made by M. Labelye, a native of France. The work was not completed till November 1748, having thus occupied eight years and nine months. The expense of its erection was L.389,500. It is built wholly of Portland stone. The difficulties in the foundation were great, and were only surmounted by L.40,000 being expended on materials for that part of the work. The length is 1223, the breadth 44, and the foot-path 7 feet. It consists of thirteen large and two small arches, the centre one of which is 76 feet wide, and the others decrease 4 feet each as they proceed towards the two end arches, which are no more than 52 feet. On each side is a stone balustrade 6 feet 9 inches in height, with arched recesses for shelter from the rain; the height of this has been a subject of censure, because it obstructs a clear view of the noble expanse of water, and of the fine objects, especially to the east, which are scattered with no unsparing hand. The tide has been known to rise at this bridge 22 feet, much to the annoyance of the inhabitants of the lower parts of Westminster, for at such times their cellars are filled with water, and the floor of Westminster Hall so covered with it, that the judges and others require boats to bring them out, or wait until the ebbing of the tide lower the water.

ge. Blackfriars' Bridge fills up the space which was once the filthy mouth of Fleet ditch, and formed a continuation of the river Fleet from Holborn Bridge, but which was a broad flat surface filled with mud, on which coal barges rested when the tide was out, but floated at the time of high-water. It was commenced in October 1760, and finished in the same month of the year 1768. The plan was furnished by Robert Mylne, a Scotch architect, and the expense of the construction was L.152,840 : 3 : 10. The corporation of London advanced the money, and were to be repaid by a daily toll, which, after some years, became only a Sunday toll, and a few years later was altogether given up. The corporation, in a political fit, resolved that it should be called after the name of William Pitt, Earl of Chatham, then a favourite statesman with that body; but that name has never been adopted, except on the brass-plate below the foundation. The small square, however, which adjoins the bridge, bears the name of Chatham Place. The bridge is composed of nine elliptical arches, the centre one of which is 100 feet wide. The whole length is 995, the breadth of the carriage-way is 28 feet, and that of the footway 7 feet. Over each pier is a recess, supported by elegant Ionic pillars, and at each extremity are handsome flights of steps leading to the water, where boats are at all times in attendance. It is just half-way between the two more recently-erected bridges called Waterloo and Southwark, and has a fine view of both, as well as of St Paul's cathedral, and many other interesting objects.

London.

Waterloo Bridge. A bridge across the Thames between those of Westminster and Blackfriars had been long a desideratum, but no effort was made to erect one before the year 1806, when Mr Dodd, an architect, formed a party, who obtained an act of Parliament, and smoothed some of the obstacles which had impeded the progress of such an undertaking. But the committee and Dodd having disagreed, the work devolved on that eminent architect the late Mr Rennie, who lived to complete this most noble of all the structures of the British metropolis. The work commenced in 1811, when the foundation was laid, by driving into the ground at the bottom of the river, the piles upon which the several piers rest. Each of those piers have under them 320 piles of 20 feet in length, and 13 inches diameter, which are driven down, being one in every square yard. The bridge is built partly of Cornish, and partly of Aberdeen granite. The arches are elliptical, and all of the same size, and the road is consequently without any elevation or depression on passing it. The roads upon both sides leading to it have been raised so as to maintain a complete level to and over it. The style of the building is plain yet noble. It consists of nine arches equal in span, being 120 feet. The whole of the road from the Strand, where its ascent begins, to the Surrey side, which has been raised on forty brick arches, is 2890 feet. The length of the stone-work within the abutments is 1242 feet. The width of the bridge within the balustrades is 42 feet, that of the pavement or footway is 7 feet. The clear water-way under the nine equal arches is 1080 feet. At each extremity of the bridge are handsome flights of steps leading to the water.

This structure was erected in five years, and first opened on the 18th of June 1817, the anniversary of the victory of Waterloo, from which it receives its name. The ceremony was graced by the presence of the Prince Regent, afterwards George IV., the Duke of Wellington, and other distinguished personages. At the extremities of the bridge are toll-houses, of neat Doric structure, with turnstiles, which, by means of machinery below, indicate the number of persons that pass through, and thus act as a check on the collectors of the toll. The cost of this bridge, which was constructed by a joint-stock company, amounted to one million sterling, and it is to be regretted that the spirited society should be such pecuniary sufferers as they are at present. The chief hope of a better state of affairs, rests upon the expectation of a great increase of buildings on the Surrey side of the river.

Vauxhall Bridge. Vauxhall Bridge, the next in date, connects Chelsea with the parish of Lambeth. It was commenced in 1813, when the first stone was laid by Charles Duke of Brunswick, and finished in 1816, at an expense of L.150,000, which is to be discharged by the tolls over it, which are necessarily high. It is composed of nine arches of equal span, made of cast-iron, resting on piers formed by a wooden frame, faced with stone and Roman cement. The length is 860 feet. The arches are 78 feet in the span, and 29 feet in height. It was projected by Mr Dodd, who began it, and for a short time the conduct of the operation fell into the hands of Mr Walker, but it finally came under the direction of Mr Rennie, by whom the work was finished. The land upon the Middlesex side was very swampy, and it has cost much to make a good road to it. It forms a good communication with the western part of the town, and especially with the buildings erecting near Belgrave Square.

Southwark Bridge.

The latest of the bridges is that called, after the part to which it leads from Queen Street, in the city, the Southwark. It was projected by Mr Wyatt, but began to be constructed by Mr Rennie in 1814, with the aid of Mr Weston as sub-engineer. It was completed in 1819, having cost, including the expense of forming the avenues to it, L. 800,000. Messrs Joliff and Banks contracted to perform the work, and the cast-iron was supplied from the foundery of the Walkers at Rotheram.

This stupendous bridge consists of three cast-iron arches, resting on massive stone piers and abutments. The distance between the abutments is 708 feet. The extent of each abutment inclosed, including the land and the inverted arches, is 71 feet, formed of solid masonry. There are two piers, 60 feet high from the bed of the river to the top of the parapet, 24 feet in breadth between high and low water marks, and 75 feet long between one acme and another of the salient angles. The foundations of these piers are each about twelve feet below the bed or bottom of the river, and rest upon a platform of timber 2½ feet thick; these platforms repose on about 420 piles, most of which are driven 24 feet into the earth, making the depth, from the shoe of the piles to the parapet of the piers, 98 feet. The two side arches are 210 feet each in span, and the centre arch 240, with 43 feet clear opening above low-water mark at medium tides. The centre arch is thus the largest in the world, exceeding the admired bridge at Sunderland by 4 feet, and that of the once highly boasted Rialto of Venice by 167 feet. Many of the iron single or solid castings weigh ten tons each, and the total weight of iron in the bridge is 5308 tons. This bridge was constructed with so much accuracy, that, when the centerings of the middle arch were removed, it only sunk at the vertex one inch and seven-eighths. At the end of the bridge are turnstiles, with machinery to shew the number of passers through, similar to those of Waterloo Bridge. The tolls are lower than those of Waterloo for all but foot-passengers. They have not yet amounted to such a sum as the shareholders expected, or as they probably will become when all the avenues leading to it receive the improvements that are in contemplation.

Thames' Tunnel.

The attempted Tunnel under the Thames is so connected with the purpose for which bridges are constructed, that the two kinds of undertakings may be said to be in contact. Mr Brunel, the eminent mechanic and projector of public works, had formed a scheme for making a tunnel under the Thames, near Gravesend, which had failed; but the failure, instead of deterring him from other attempts, urged him on, by the conviction that it was practicable, and would be beneficial to the public. The confidence in his talents, assiduity, and integrity, was so great, that a company was speedily formed, and an act of Parliament was passed, incorporating it, for the specific purpose of the tunnel, in June 1824. The expense was estimated at L 160,000, which was soon subscribed.

The great merit of the invention for excavating with security, entitles it to a particular description. A general idea of the means proposed by this great engineer may be obtained by supposing a hollow box, of sufficient strength for its purpose, open to the rear, but closed on the front with moveable boards, and sufficiently large to contain one man at work. The front is placed against the face of the earth to be removed, and separates the workman from it. By means of the moveable boards, he can expose any part of the earth at his discretion. When he has removed one board, he excavates the earth which was behind it, to the depth directed, and places the board against the new vertical surface exposed; the board is then in advance of the box, and is kept in its place by props, which have their support in the rear. When he has thus proceeded with all the boards, it will be evident that an excavation will have been made equal to the area of the front of the box, and of a certain depth; and that the boards will be all in advance equal to this depth, and held there, disengaged from the box. The box is then pushed forward by screws to the boards, and the operation of excavation then recommences. The brick-work is immediately executed up to the box, and the security of the work is complete. When the area of excavation is proposed to be large, as in the case of this particular tunnel, a number of similar boxes is required. Their size is not increased, but they are arranged side by side to the width intended, and tier on tier to the height proposed. Those which are over each other are attached so as to be moved together in one vertical group, and have no connexion with the others on their sides. This whole assemblage is called the shield. In large excavations the whole shield is not moved forward at once; any one of the vertical groups may be advanced independently of any other, and the mode adopted is, to push on the alternate ones equally to a certain distance in front, and then to bring up and advance those left behind through the intervals of the first, and so on alternately.

Early in the year 1825 the shaft was begun which was necessary to be sunk on the Rotherhithe shore, in order to get down to the level of the intended works at that end of the tunnel. The sinking of this shaft, though the principle was well known to those employed in sinking wells, required a great degree of skill and intrepidity on the part of the engineer, owing to the magnitude of the operation.

A tower or cylinder of brick-work, 50 feet in diameter, 40 feet in height, and the walls of which were 3 feet in thickness, and resting on a circle of cast-iron, having its lower edges chisel-shaped, was built with the utmost care on the surface of the ground, and immediately over the situation of the intended shaft. In the upper part was suspended a steam-engine, of thirty-six horse power, for the purpose of draining and lifting the excavated earth to the surface.

This tower was begun on the 2d of March 1825, and, on the 1st of April, the excavation commenced within the inclosure. As the work proceeded, this vast structure, with its engine, descended without accident, and continued to do so for twenty days, through successive strata of gravel and other earths, until, at 37 feet from the surface, it rested upon a solid bed of clay. It was there permitted to remain, but the excavation was continued, and the cylinder under built to the depth of 24 feet. At this level the diameter was reduced to 25 feet, and another cylinder inserted, sunk 20 feet more. This lower part was intended as a tank or receptacle for drainage water; and suction pipes of the engine-pump were carried into it, for the purpose of carrying it off. The total height of this extraordinary shaft is 84 feet, 64 feet of which are of 50 feet diameter, and 20 of 25 feet. It consumed 260,000 bricks, and 1200 barrels of cement, and the weight of it is about 900 tons. It is intended eventually as the staircase for persons on foot. Near it, a little to the southward, a shaft is to be built, by which carriages are to ascend and descend, which will be 160 feet in diameter.

The soundings along the proposed line across the river give 12 feet water at low tide, and 36 at the highest, in the deepest parts; the bed of the river was found to be a stratum of sand, about 3 feet 8 inches thick, lying upon one of about half that thickness, composed of clay and sand, beneath which was a bed of tenacious clay. The descending order of the strata, at the lower part of this bed, in which the tunnel is executed, is as follows: Stiff blue clay about 2 feet; silt, 7 feet; silt, mixed with shells, 7 feet; indurated clay, 3 feet; silt and gravel stones, 3 feet. It was found that the whole length from shaft to shaft would be 1300 feet.

Early in December the first horizontal excavation commenced. At the bottom of the wider part of the shaft a shield of cast-iron, weighing 120 tons, 37 feet in width by 22 feet in height, and 8 feet in depth, with a complement of thirty-six men, each in his respective cell, was entered nto the solid earth, and began its new and extraordinary march. It proceeded for several months, at a rate of about wo feet in twenty-four hours, displacing from 90 to 100 tons of earth, which was lifted to the surface by the engine in the haft. In each foot 5500 bricks were used. On the 2d of March 1826, it had advanced 470 feet, or about one-third of he whole length; and, though the line of the tunnel dips about 3 feet in 100, the excavation in one part, towards the middle of the river, had approached within 10 feet of the water above it. The brick-work which followed immediately, illed exactly the aperture which was made by the shield, and contained in its mass two arched passages or roadways, each 13 feet 9 inches wide, and 16 feet 10 inches high, lying by the side of each other, with a wall of 3 feet inches between them. The passages at first have no conexion, but are subsequently laid together by arched erforations through the brick-work that separates them. The sides are three feet, and the arches at top and botom 2 feet 7 inches thick at their smallest parts. About 1,000 bricks per day were used, entirely laid in cement; nd the labour of one hundred men was constantly kept p by relays at stated periods. A main from a gas-work was laid along the floor, which conveyed the gas to columns laced in the connecting arches as they were formed, branches rom which illuminated both the roadways, and a total freeom from water was preserved by drains beneath, which mptied themselves into the engine-tank beneath in the haft. In the use of these, and innumerable other expeients to facilitate the progress, and anticipate or overcome he difficulties, of this extraordinary work, Mr Brunel dislayed such fertility of invention, depth of resource, and rofessional intrepidity, as must place him in the highest ank of professional engineers. But these qualities were estined to a very severe trial. On the 18th of May 1827, t a distance of 544 feet from the shaft, the river found its way through a portion of loose earth, and entered the tunnel, through the shield, with a velocity and volume that illed the tunnel and the shaft in fifteen minutes. This appened whilst the workmen were at their duties, but no ives were lost. About 1000 tons of loose soil and rubbish escended into the tunnel.

The breach was examined by means of the diving-bell, nd repaired by depositing about 1500 cubic yards of clay, n bags, in and around it. The water was then pumped out, nd the permanent works were found very slightly injured; he shield was restored and adjusted, and in the latter part f September the work was recommenced. The dangerus part was passed, and 52 feet added to the length beore achieved, when, on the 12th January 1828, the river roke through the shield a second time. The tunnel as filled in less than ten minutes, and the rush of water rought with it a current of air that put out the lights; nd, principally owing to this circumstance, six of the worken were unable to extricate themselves; the rest escapd. Mr Brunel reported that the aperture in the bed of he river was much less than at the former accident, and onsequently that the mischief might be repaired at much ss expense. The point at which this irruption occurred as at 600 feet from the shaft, within 25 feet of the middle f the channel of the river, leaving about 700 feet to be xecuted. The breach was, however, stopped, the water umped out, and the rubbish removed.

The funds of the company were now nearly exhausted.

Independently of the expense caused by this last accident, the expenditure up to that time had been L. 157,000, of which about L. 38,500 had been laid out in the purchase of premises and machinery, and L. 118,500 in the works. The directors, in their report, state that the sum of L.75,000 will be required to complete the Tunnel to the north embankment. As the public appeared to take a great interest in the completion of the work, it was resolved to try the effect of contributions; but though some individuals subscribed liberally, the amount was on the whole but small, and not more than sufficient to clear the works. It was then determined to open the tunnel to the inspection of the public, on paying one shilling for admission. But this has done little more than defray the expense of keeping the works and the machinery in good order.

Of late the government has been prevailed upon to grant the company a loan of exchequer bills, and the work is again proceeding; but the prospect of its completion is still obscure, owing more to the want of pecuniary power than to any doubt of the practicability of its final accomplishment.

Hospitals.

St Thomas's.

The Hospitals of London are numerous, and some of them very wealthy, especially those of royal foundation, which will here receive the first notice. *St Thomas's Hospital*, in the High Street of Southwark, was founded by the prior of Bermondsey in 1213, and surrendered to Henry VIII. in the year 1538. The corporation of London having purchased the manor of Southwark in the reign of Edward VI., are ex-officio governors; but others are elected as governors who subscribe L.50 to the institution. The building having become dilapidated by time, was taken down, and rebuilt by voluntary subscriptions in 1693, and then formed three squares, to which were added, in 1752, a new portion of considerable magnificence, which comprised several wards and various offices. It now consists of four quadrangular courts. In the first are the wards for females; in the second two chapels, with houses for the treasurer and other officers; the third court contains wards for the men; and the fourth, besides wards for men, has hot and cold baths, a surgery, the theatre, capable of containing 300 persons, in which lectures to the pupils are delivered, and the apothecary's dispensary.

There are in the institution 18 wards, with 485 beds. It is destined to receive the sick poor, and those maimed by accident. The former must be recommended by a governor, but the latter are received at any hour, without recommendation. The annual expenditure is about L. 10,000; and in some years 11,000 patients have received assistance either within the building, or at their own residences. This is one of the chief surgical schools of the metropolis. The medical officers being men of the greatest talents in the profession, naturally draw around them those who are solicitous to acquire skill and knowledge.

St Bartholomew's.

St Bartholomew's Hospital is near the church of St Bartholomew the Greater. It is in fact only the choir of an ancient conventual church, belonging to a priory of blackfriars, founded by one Ralière, who had been a minstrel or jester to King Henry I., whom, as the tradition goes, in a horrible dream, from which he was delivered by St Bartholomew's appearance, the saint warned to quit his profligate life, and found this religious house. To this person, however, who lived in the year 1102, have the inhabitants of London, during more than seven centuries, been indebted for one of the most beneficent of its public institutions.

The king made Ralière a present of a waste spot of ground, on which he built an hospital for a master, brethren and sisters, for the entertainment of the diseased poor, for women with child till they should be delivered, and for the support of such children whose mothers died in the house, till they obtained the age of seven years. It was placed under the management of the priory; and its revenues, by what means acquired does not appear, were found, at the dissolution of the priory, to amount to about L. 305 annually, a large sum at that day. By the liberality of numerous contributors, by benevolent legacies, and above all by the increased value of land, this institution has gone on increasing in wealth and utility. The present building was commenced in 1729. Although the ancient erections had escaped the great fire of 1666, yet they had become ruinous from age, when, by voluntary subscriptions, a sum to rebuild it wholly was collected. It is a noble pile, composed of four buildings, which form a large square, and are joined together by stone gateways. One of these piles contains a large hall for meetings of the governors, an accounting-house, and other offices; and the three other piles consist of apartments well arranged, in which are the patients. The principal gate is of the Doric order, consisting of a large arch placed between two pillars, supported by emblematic figures. The grand staircase, leading to the hall used by the governors, was gratuitously painted by Hogarth, and the subjects are the Good Samaritan and the Pool of Bethesda. The hall is deemed the finest apartment in London, its proportions being those of a double cube. Henry VIII. settled L. 500 per annum on the institution, and a full length portrait of him adorns the room, whilst the walls are covered with the names of the contributors, who, by donations of L. 50 and upwards, have been chosen governors. There is also a fine portrait of Dr Ratcliffe, who left L. 500 a-year for the improvement of the diet, and L. 100 a-year to purchase linen for the patients; and of Perceval Pott, the eminent surgeon, who was a great benefactor to the institution. In the window there is a portrait of Henry VIII. delivering the charter to the Lord Mayor, and Prince Arthur, with two noblemen holding white rods, standing near him. Attached to the south pile of the square is the dispensary, a stone building, in which medicines and dressings are prepared.

The physicians and surgeons of this establishment are the first for skill and talent in the kingdom; and this, with the numerous patients, makes it one of the best medical schools of the metropolis. The number of patients annually relieved generally exceed 10,000; and the expenditure of the institution, about equal to its income, is nearly L. 30,000 a-year.

Guy's. *Guy's Hospital*, in St Thomas's Street, Southwark, is perhaps the most extensive beneficent institution, that in modern ages has been founded by one individual. Thomas Guy was the son of an anabaptist lighterman and coal-dealer in the borough. Upon his death his widow removed to her native town of Tamworth, with her only child, and from thence at the proper age sent him to London, to be bound apprentice to a bookseller in Cheapside. When he had served his term, he commenced business for himself, with a capital of two hundred pounds. He connected himself with some others in an illegal trade in bibles, which were printed in Holland and smuggled into this country, to the great injury of those who enjoyed the exclusive right to deal in them. This was successfully carried on for some time; but it was abandoned by some prosecutions. Guy then prevailed on the University of Oxford to contract with him for their privilege of printing bibles. By this and other operations, accompanied with great economy, he was enabled to amass an early competence, and then he established some charitable institutions in Tamworth, where he had passed his early youth. By the sale of bibles, by buying up seamen's tickets in the latter part of the reign of Queen Anne, when they were at a great discount, and operations in South Sea stock in the reign of George I., he had acquired a vast fortune, without increasing in the same degree his personal expenses.

Guy had been a most extensive contributor, at an early period of his prosperity, to the hospital of St Thomas, in which he had been at the expense of adding to the former part three additional wards. At seventy-six years of age, he took from the governors of that hospital a piece of vacant ground adjoining, on lease for 999 years, for which he paid them L. 18,793, 16s., and began to build his hospital in 1721. At his death, which happened in 1724, he bequeathed to the institution the vast sum of L. 219,499.

The building is entered from an area, inclosed by handsome iron gates, in which is a statue of the founder. It consists of a centre and two wings, and behind the former a separate part for the reception of lunatics. One of the wings contains a hall and a room for business, and the other a chapel.

The hospital was originally established for 400 sick and diseased persons, and for 20 incurable lunatics. The average number now admitted is about 2250 patients, besides upwards of 20,000 out-patients. It has an admirable establishment of medical men of the highest rank in the several branches of the healing art, and is one of the best schools for students in medicine and surgery.

The governors are a corporate body, appointed from those of St Thomas's, in number sixty; and if there are not forty, the Lord Chancellor has the power to name as many as shall complete the number to fifty. A committee of twenty-one has the management of the interior, of whom seven are changed each year. There is attendance at the surgery constantly, and all accidental patients are instantly admitted.

A splendid bequest has been added to the previous resources of the institution, by the will of Mr Thomas Hunt, who, in 1829, left L. 200,000, on condition that adequate accommodation should be made for the admission of 100 additional patients.

Christ-church. *Christ-church Hospital*, near St Bartholomew's, is a royal foundation. It was originally the house of the Greyfriars, or mendicants of the order of St Francis, founded in 1225, by John Ewen, a mercer. The church was considered as the most superb of the conventual class, and was erected by the contributions of various devout and distinguished persons. The choir was added in 1306 by Margaret, second Queen to Edward I. Isabella, Queen to Edward II., gave three score and ten pounds of silver, and Queen Philippa, wife of Edward III., gave three score and two pounds, towards the building. John de Bretagne, Duke of Richmond, built the body of the church at a vast expense, and Robert de Clare, Earl of Gloucester, gave twenty great beams out of his forest of Tunbridge.

The reputation for sanctity which this order of friars had acquired was so great, that numbers of persons of the highest rank deemed their future state secure if they died in that order, and were interred within its walls. Multitudes, therefore, were crowded into this holy ground. Amongst others, no less than four queens are recorded, and many of the highest rank of the nobility, and members of the royal family. Many of those who suffered under the sentence of the law for atrocious or for state crimes were consigned to the holy precincts, in order to secure their eternal salvation.

At the suppression of the religious houses by Henry VIII., the fine church, after being despoiled of its ornaments for the king's use, was made a storehouse for French prizes, and the monuments were sold or destroyed; but Henry, from remorse or superstitious fear, granted the church to the city, and directed it to be opened for divine service.

The conventual building remained in a dilapidated state till the latter end of the reign of Edward VI. The story told is, that the amiable young prince was so deeply impressed by a sermon which he heard from Bishop Ridley, that he resolved to found three great hospitals in the city. These were, St Thomas's, in the borough of Southwark, for the sick or wounded poor; Bridewell, for the thriftless; and

Christchurch, for orphans and other poor children, to be aken care of, and apprenticed at proper ages to different rades.

At first this institution was upon a contracted scale, but eing gradually enlarged, it consists of common schools for oys and girls. Charles II. joined to it a mathematical school, nd charged the Exchequer with an annuity of L.1000 for s support; and a private individual, named Travers, inreased the capacity for that kind of study. The corporaion of London are governors, but any individual contriuting L.400 is elected to that rank. The pupils are noinated by the governors in their turn as vacancies occur; ut the aldermen of London have one annual nomination ach. The greater part of the children admitted are those f freemen of London, or of clergymen of the established hurch. A branch of this institution is maintained at Hertord. The total number of children is about 1100. The ducation is well conducted, and, as there are funds approriated for that purpose, those who excel in classical learng have good exhibitions at the university. The matheatical boys are fitted for the navy or other professions; nd many very distinguished men have received their eduation here. The buildings are old and irregular; but of te years have received great improvements, and latterly n opening has been made into Newgate Street, shewing e front of the new hall, in the architecture of the Tudor ge. In the hall is a fine picture of Edward, the founder, y Hans Holbein. The pupils are well fed, and warmy, though coarsely clothed, and carefully attended when ck. The masters are generally men of great merit. The hole expenditure of the establishment amounts to about .30,000.

Bethlehem or Bedlam Hospital. Although this instituon has been recently removed to a more convenient situaon, yet some notice of the origin and history of an estalishment that has generally engaged the attention of all ersons who have either a permanent or a temporary conection with London, cannot be unnecessary here.

The ancient building of St Mary of Bethlehem was foundd by Simon Fitzmary, sheriff of London, in 1247. It consted of a prior and canons, brethren and sisters, and proably stood in St Martin's in the Fields, but was removed rom thence at the instance of one of our kings, who was nnoyed at the presence of lunatics, for whom it was foundd, being so near his own residence. It was therefore reoved to Bethlehem without Bishopsgate. In 1545, the ity was presented with the hospital, and under their direcon it continued till it was found too small for the numer of unfortunate beings that sought relief. In 1675, the ord Mayor and Aldermen removed the hospital to the uth end of Moorfields, and, at an expense of L.16,000, rected a magnificent pile of buildings. It was designed ter the plan of the palace of the Tuilleries in Paris. ouis XIV. was so incensed that his palace should be made e model for a lunatic hospital, that it was said he ordered most whimsical and not very decent revenge. This buildg was 540 feet in length, with a gallery from one end to e other, out of which were the doors to the ranges of apartents for the patients on both sides of it. Two large wings ere added to the building in 1734, which enabled it to adit 250 patients. Being in a decayed state, it was resolved remove the whole institution to a more airy spot. The ew hospital was begun in St George's Fields in 1812, and nished in 1814, at the cost of L.100,000. It has a magnicent front 580 feet in length; the centre is surmounted y a dome, and ornamented with an Ionic portico of six olumns, supporting the arms of the United Kingdom. The terior is well arranged, and capable of receiving 200 paents. In the hall are two fine figures representing raving d melancholy madness, which were formerly on pedesals before Old Bedlam, and have always excited the greatest admiration. The annual income and expenditure of this institution is about L.18,000.

An account of the number of Patients admitted into Bethlehem Hospital in the years from 1820 *to* 1832, *both years inclusive.*

	Males.	Females.
Curables admitted, . . .	1047	1534
Incurables, ...	29	51
Criminals admitted, . .	37	24
	1113	1609
Cured, ...	242	461
Died, ...	90	86

Of those cured, four males and sixteen females were of the class deemed incurable; and of those who died, seventeen males and twenty-four females were of that class.

Bridewell.

Bridewell is in Bridge Street, Blackfriars, which, as well as the church and the parish in which it stands, received the name from a holy well dedicated to St Bridget or Bride. It was formed in part out of the remains of an ancient castle, which stood near the river Fleet. Many of the materials, in the reign of William the Conqueror, and in that of Henry I., were applied to reconstruct St Paul's cathedral. It subsequently became the residence of several of our monarchs; and Henry VIII. fitted it up for the reception of the Emperor Charles V., upon occasion of his visit to England in the year 1522. The emperor, however, preferred the Abbey of Blackfriars for his own residence, but his retinue was lodged at Bridewell, and both were connected by a gallery over Fleet-ditch, and a passage cut through the city wall. Henry himself took up his abode in Bridewell in 1529, whilst the question of the validity of his marriage was under discussion in the hall of Blackfriars.

It was neglected and had fallen into a state of decay, when Bishop Ridley requested it of Edward VI. for a charitable purpose. It thus came into the hands of the city, who have used it as a house of correction for disorderly persons, idle apprentices, and vagrants; and of late years eight or nine hundred persons have been annually consigned to it for punishment or amendment. The buildings consist of a quadrangle, on one side of which is an extensive hall, representing the founder and some of the benefactors; whilst the other sides are occupied by the prisoners. Another house connected with the institution has been recently erected in St George's Fields.

The Church of St Bride's, near to this building, was erected by Sir Christopher Wren, and is distinguished by the beauty of its spire. The interior is imposing. It has a clock illuminated at night; and it has been in some measure opened to the public view, by purchasing the ruins of some houses which had been burned down in Fleet Street.

Besides those of royal foundation, the following are the most considerable hospitals that depend on donations already received, or on annual subscribers, or on presents at admission to the government.

St George's.

St George's Hospital, at Hyde Park Corner, was opened in 1733 for the reception of sick and lame patients; but as the building was too confined, it was begun to be taken down in 1828, and to be gradually rebuilt on a much larger scale. Contributions for the purpose have flowed in with great liberality. The magnificent structure, which is an ornament to the entrance of London, has been completed, and now about 350 beds are set up to receive patients; whilst the poor are supplied with medicines without being received into the house when the beds are full.

Middlesex.

The *Middlesex Hospital*, in Charles Street, Cavendish Square, was founded in 1745, for the relief of sick and lame patients, for the reception or attendance at their own homes of lying-in married women, and for supplying the indigent sick with advice, medicine, diet, and lodging. There was afterwards added, by the liberality of the late Mr Whitbread, a department for patients afflicted with cancer, who are admitted to remain during their lifetime. The hospital is capable of receiving 300 patients; but many are attended at their homes, and supplied with medicines, under the superintendence of three physicians, an accoucheur, and three surgeons. It is under the management of a patron, a president, fourteen vice-presidents, and a committee of the governors, who are such persons as contribute three guineas annually to the establishment.

The London.

The *London Hospital* is a vast pile of building in Whitechapel Road, to which spot it was removed, when it obtained a charter, in 1759. It had before existed in Prescot Street, Goodman's Fields, since 1740. The patients received here are chiefly sick and wounded seamen, watermen, coal-heavers, ship-wrights, rope-makers, and labourers in the dockyards and on the quays. It is a subject of regret that this hospital, situated in a district where more relief is required for the sick and diseased than perhaps in any other division of the metropolis, should be so deficient in resources to be unable to occupy the whole of the building with patients, though zealous attempts have not been wanting to obtain the disposal of more ample funds.

St Luke's.

St Luke's Hospital, in Old Street Road, was originally instituted at a place called Windmill Hill, near Moorfields, in 1732, and removed to the present spot in 1751, but not completed till 1786. It is destined for the reception of such lunatics as are deemed incurable, as well as for those of whom some hope is entertained. It is a solid large edifice, nearly 500 feet in length, consisting of three stories besides the basement, and with attics at the extremities; and the whole has an imposing effect. The interior contains apartments for the medical and the other officers, and accommodation for 300 patients, of whom 100 are on the incurable list.

The annual income of the hospital is about L.9000. Persons paying twenty guineas at once, or paying seven guineas, and agreeing to pay three pounds eighteen shillings in the four succeeding years, are admitted to become governors.

An account of the Patients received into St Luke's Hospital in the years from 1751 *to* 1834, *both inclusive.*

	Males.	Females.
Of those deemed incurable at the time of their admission, there have been .	6040	8847
Of which there were cured, . .	4181	3938
Died, ...	718	469
Of those deemed incurable, . .	222	319
Cured, ...	3	13
Died, ...	147	205

Charitable institutions.

The charitable institutions of London and the adjacent villages are so numerous, that they will not admit of minute accounts being given of the whole of them. Some of the most distinguished for their magnitude, their antiquity, or their utility, have been already noticed, and the remainder can only be enumerated, with the date of their origin, their locality, and the purposes to which they are applied.

Institutions for Medical and Surgical Relief generally.

Westminster Hospital, founded in 1719, in James Street, Buckingham Gate, now rebuilding on a larger scale.

Charing Cross Hospital, in King William Street, founded in 1831, and recently opened to patients.

Hospital of Surgery, in Panton Square, St James's, founded in 1827.

Royal Metropolitan Infirmary for Sick Children, in Broad Street, Golden Square, opened in 1830.

Royal Universal Infirmary for Children, in Waterloo-Bridge Road, founded in 1816.

Seamen's Hospital on board the ship Grampus, founded in 1821, having an office in Bishopsgate Street Within.

French Hospital for Protestant Refugees, in Luke Street, Old Street, founded in 1716.

Asylum for the Recovery of Health for Persons in Narrow Circumstances, who, by paying a small sum weekly, are accommodated better than they can be in hospitals or in private houses, founded in 1820, at Leisson Grove, Marylebone.

Jews' Hospital for the Support of Aged and Sick, in Mile-End Road, founded in 1797, by voluntary subscriptions.

Institutions for Particular Complaints.

Hospital for Casual Small-Pox and for Vaccination, in Pancras Road, Gray's Inn Lane, founded in 1746.

London Fever Hospital, in Pancras Road, founded in 1820.

Lock Hospital for the Cure of Venereal Complaints, at Grosvenor Place, Hyde-Park Corner, founded in 1746.

Asylum for the Deaf and Dumb Poor Children, a large building, with means of receiving 200 children, and teaching them some handicraft trades, in the Kent Road, and was founded in 1792.

London General Institution for the Gratuitous Cure of Malignant Diseases in Greville Street, founded in 1820.

Institution for the Cure and Relief of Glandular and Cancerous Complaints, founded in 1820, in Nelson Square.

Royal Infirmary for Diseases of the Eye, founded in 1804, in Cork Street, Burlington Gardens.

Institution for the Gratuitous Cure of Cataract, in Windmill Street, founded in 1819.

London Ophthalmic Infirmary, founded in Moorfields in 1805.

Kent and Surrey Eye Infirmary, in Dean Street, Southwark.

Surrey and Southwark Infirmary for Curing Diseases of the Eye and Ear, founded in 1828.

Royal Westminster Infirmary for Diseases of the Eye, founded in 1828, in Marylebone Street, Piccadilly.

Royal Infirmary for Diseases of the Ear, in Dean Street, Soho, founded in 1816.

City of London Truss Society, in Queen Street, Cheapside, founded in 1807.

Rupture Society, Golden Square, founded in 1805.

Southwark Truss Society, in High Street, Southwark, founded in 1811.

London and Westminster Infirmary for Cutaneous Diseases, Great Marlborough Street, founded in 1819.

Asylum for the Cure of Scrofula and Cancer, on the Terrace, Bayswater, founded in 1822.

Infirmary for Asthma, Consumption, and Diseases of the Lungs, Union Street, Bishopsgate.

National Vaccine Establishment, Percy Street.

Vaccine Pock Institution, Broad Street, Golden Square, founded in 1799.

London Vaccine Institution, in Union Court, Holborn, founded in 1800.

Royal Jennerian Society, in Beer Street, near the Tower.

Lying-In Hospitals, Infirmaries, and Charities.

Queen Charlotte's Lying-in Hospital, Manor-House, Leisson Grove, founded in 1752.

City of London Lying-in Hospital for Pregnant Married Women, in the City-Road, founded in 1750.

British Lying-in Hospital for Married Women, in Brownlow Street, founded in 1742.

General Lying-in Hospital, in York-Road, Lambeth, founded in 1755.

Westminster Lying-in Hospital, in Queen's Square, founded in 1801.

Royal West London Infirmary and Lying-in Institution, Villars Street, Strand, founded in 1818.

Royal Maternity Charity for Delivering Poor Married Women at their own Houses, in Knight Rider Street, founded in 1757.

Ladies' Benevolent Society for the Relief of Poor Lying-in Women, in Salisbury Street, founded in 1813.

United Institution of London and Westminster for the Relief and Delivery of Indigent Women, and for the Treatment of Diseases incident to Children, in Warwick Street, Golden Square, and Philip Lane, London Wall, founded in 1822.

The City of London Lying-in Institution for Providing Medicines and Nurses to Poor Married Women in their own Houses, founded in 1811, in Swan Alley, Colman Street.

Endeavour Lying-in Charity for Delivering Poor Women, and Lending Clothes, in Norton Street, founded in 1794.

Ladies' Lying-in Charity for St Andrew's, Holborn.

New Court Benevolent Society for Relieving Married Women during their Confinement, in New Court, Carey Street, founded in 1814.

Finsbury Midwifery Institution, in St John's Street, Clerkenwell, founded in 1823.

The Ladies' Benevolent Society for Relieving and Clothing Jewish Married Lying-in Women at their own Houses, in Artillery Place, founded in 1812.

To the list of charities connected with the circumstances of disease, might be added the names and situations of twenty-seven dispensaries. These are to be found in every district of the metropolis, and in them constant attendance is given to the cases of the diseased, who are recommended by governors. Advice and medicines are afforded gratis at the houses, and the sick unable to attend are visited by the professional men at their own homes. It deserves to be noticed, to the credit of the liberality of the gentlemen of the medical profession, that in all of those charities the aid of physicians and surgeons of the greatest skill is gratuitously afforded.

Besides those charitable associations in behalf of lying-in women, which appear ostensibly, there are in every quarter small societies of from ten to twenty ladies, who furnish the necessary clothing and food, within their respective circles, to indigent females, whilst waiting for, or recovering from, their confinement. The benevolence of the inhabitants of London, proved by the numerous institutions for the relief of the diseased, has had a beneficial effect on the health of the whole of the population of the kingdom. It has produced one of the best schools of the healing art, because one in which the greatest number and variety of cases may be attentively examined, and where instructions arising from actual practice may be most advantageously acquired.

Schools of anatomy were first opened in London about the year 1720, and have been extending ever since; and now every hospital has become a school, at which not only anatomy, but every branch of medical or surgical knowledge, may be acquired. Lectures are delivered by men of the first eminence, during the winter months, and practice, especially in the hospitals, is admirably combined with theory. By a late law, greater facility has been given to the study of anatomy, by the greater facility of obtaining subjects for dissection than was formerly enjoyed.

The more public establishments for the promotion of the art of healing may be here noticed.

College of Physicians.

The College of Physicians stood originally in Knight Rider Street, then in Amen Corner, and at length in Warwick Lane, near to Newgate. It was founded by a Dr Linacre, who first rescued the medical art from the hands of illiterate monks and empirics. He had studied in Italy, and had been successively physician to Henry VII. and VIII., and Edward VI., in whose reign he died, in 1524. He was the first president of the college, and was succeeded by Dr Caius, the founder of the college of that name in Cambridge.

As the building in Warwick Lane had become injured by time, it was resolved to build a new and more appropriate pile, in a more favourable spot. Pall-Mall East has been selected, and its eastern side forms a most imposing part of the new square, in which the image of Charles I. stands. It was designed by that eminent artist Smirke, and the valuable materials of the ancient house were removed to it in 1823. The portico, of six Ionic columns, leads to a noble hall, the roof of which is supported by fluted Doric pillars, each consisting of a single block of stone. On the left is a dining-room, in which are numerous portraits, particularly those of Henry VIII., Cardinal Wolsey, and Sir Hans Sloane. A handsome staircase leads up to the library, which is surrounded with a gallery, and contains a valuable collection of books, and some anatomical preparations, and also portraits of Drs Harvey and Ratcliffe, with a bust of King George IV., by Chantrey. The examiners' room has several portraits, as well as busts of Drs Baillie, Mead, and Sydenham. There is also a small but neat theatre, a reading-room, and other apartments.

The college is constituted in a president, elects, and fellows, who license all physicians who practise in the bills of mortality, and grant extra licenses to those who practise in the rest of the kingdom. The fellows can only be appointed by such as have graduated at Oxford or Cambridge.

College of Surgeons.

The Royal College of Surgeons was assembled for many years in the Old Bailey, near the Sessions-House, and the bodies of those criminals were carried to it for dissection, who by the law were subject to that operation. It has been now removed to Lincoln's Inn Fields, to a structure erected for the use of the college.

This was one of the old city guilds or companies connected with that of the barbers till the reign of Henry VIII., when they obtained a separate charter. Since that time various and important regulations have been obtained to increase its utility and respectability. The duty of examining medical officers for the navy and army, and for the East India service, has devolved on them, and without their examination no person is allowed to practise surgery in London or Westminster, or in a circuit of seven miles round the hall.

The hall is a noble building of the Ionic order, with a handsome portico, over which is inscribed, *Collegium regale chirurgorum*, and above that are the arms of the college, supported by the two sons of Æsculapius. The interior is grand and appropriate, containing a theatre in which lectures are delivered on anatomy and other subjects connected with the profession, which are illustrated by the collection in the rich museum, and especially the invaluable preparations of the late John Hunter, purchased by order of the government. In these is exposed to view the gradations of nature from the most simple state in which life is found to exist up to the most perfect and most complex of the animal creation, man. There is also a rare collection of objects of natural history, with specimens of vegetable and fossil productions. There is also a most valuable library, and admission to every part is to be obtained from any member of the company.

The apothecaries of London were formerly incorporated with the company of grocers; but in 1617 a separate charter was granted to them, which enabled them to regulate the sale of drugs and medicines, and to sell them for gain. This is now a trading company. They have a house and large old premises in Water Lane, near Blackfriars Bridge, where they sell drugs and chemical preparations, and such is the accuracy with which the latter are prepared, that many practitioners administer none but what is obtained from their laboratory. The whole of the medicines for the navy and the army are compounded and supplied from their manufactory or stores. Prescriptions for private persons are also made up by them. The Physic Garden at Chelsea is under the direction of this company, having been bequeathed to them by Sir Hans Sloane, on condition that they should present annually to the Royal Society fifty new plants till the number should amount to 2000. This condition has been punctually fulfilled, and the specimens are preserved in the collection of that society. A general herbarizing tour is made yearly by the members of the company for the improvement of students and apprentices. By some legislative enactments several powers have been conferred on the company. No person is now allowed to practise in any part of England or Wales, without having first obtained a certificate of his qualification from the court of examiners of this company. As a trading concern it is profitable, and the directors, besides giving very sumptuous entertainments, divide a good yearly sum amongst its members.

Independent societies.

There are a variety of independent societies established in London, which are voluntary associations, and not incorporated bodies. One of the first of these is in Bolt Court, Fleet Street, and was opened in 1773 at Crane Court, by an introductory lecture delivered by Dr Lettsom. There is a library, consisting of more than 30,000 volumes; and the object of the society is to receive medical papers, and useful facts, respecting difficult and extraordinary cases, to increase exertion by bestowing honorary rewards, and to preserve and increase their collection of medical books.

Another and similar association was established in Lincolns-Inn-Fields in 1805. It has an extensive library, and ranks amongst its members some of the most eminent members of the faculty in the metropolis.

Lectures on anatomy, physiology, medicine, obstetrics, and chemistry, are delivered at stated times at the various hospitals, at the London University, and at King's College, by the most celebrated men in the profession. Others are delivered at theatres of anatomy in Great Windmill Street, at Mr Tanton's in Hatton Garden, at a theatre in Webb Street, Maze Pond, in the borough, and by many medical men at their own houses. These lectures are sometimes advertised in the newspapers, but more commonly made known by the medical booksellers. The terms vary from two to five guineas for the first course, but to those who attend more than one, the rate is subsequently lowered, as well as for an annual or perpetual ticket of admission. These lectures are commonly given in the autumn or the winter.

The Royal Humane Society may not improperly be noticed in connexion with medical societies. The object is to restore persons apparently drowned. It was founded in 1774, and has a permanent house in Chatham Place. It has been so far of use that more than five thousand persons have been rescued from death, after their lives appeared to have terminated; and by its example forty-five other similar associations have been formed in different parts of the kingdom. The Society offers rewards to persons who, within a certain time after the accident, rescue drowned people from the water, and convey them to places where means for their recovery can be applied, and also gives medals to those who have exerted themselves to save persons from death by water. It has eighteen receiving houses in and about London, the principal of which is in Hyde Park, near the Serpentine River. In them every thing necessary for the resuscitating process is kept in a state of constant readiness, and attendance can be immediately obtained.

A Veterinary College was established at Camden Town in the year 1791, for promoting the knowledge of farriery, under a president and twenty-four directors. There is a professor, and, upon an average, about thirty pupils. The buildings are extensive, and appropriate lectures are delivered, and dissections performed, whilst an infirmary for horses has been established.

In looking at the edifices in London dedicated to religious purposes, it is impossible, from their great number, that the great majority can receive any further notice than the bare mention of their names. But the two cathedrals are national objects, to which all look with attention and a degree of veneration that requires a descriptive account, and some others are sufficiently distinguished to claim more notice than being merely named.

Cathedrals. St Paul's.

The cathedral church of St Paul's, the fame of which is only second to that of St Peter's at Rome, stands on an elevated spot, the best that could have been chosen for its display, above the north bank of the river Thames, on the position where similar ecclesiastical edifices, through a succession of centuries, had been placed

The best authority we have for the origin of this church, is that of its great restorer Sir Christopher Wren. His opinion that there had been a church on the spot, built by the Christians in the time of the Romans, was confirmed. When he searched for the foundations for his own design, he met with those of the original presbyterium or the semicircular chancel of the old church. They consisted wholly of Kentish ruble-stone, artfully worked, and consolidated with exceedingly hard mortar in the Roman manner, and much excelling the superstructure. He refutes the notion which had prevailed of its having been a temple of Diana.

The first church is supposed to have been destroyed in the persecution of Diocletian, and to have been rebuilt in the reign of Constantine. This was again demolished by the Pagan Saxons, and restored in 603, by Sebert, a petty prince, ruling under Ethelbert, King of Kent, the first monarch of the Saxon race, who, at the instance of St Augustin, appointed Melitus, the first Bishop of London. Erkenwald, the son of King Ossa, the fourth in succession after Melitus, ornamented the cathedral very highly, and improved its revenues from his own patrimony. For this he was canonized, and his relics, with those of his dress and furniture, were imagined to have virtues sufficient to restore the sick to health.

When the city was destroyed by fire in 1086, the church was burned, when Bishop Mauritius began to rebuild it, and laid those foundations, which remained till its last destruction by fire in 1666. Though that prelate lived twenty years, and his successor Beauvages enjoyed the see upon equal terms; yet, from the magnitude of the plan, it was still unfinished. Henry I. granted materials, consisting of part of the Palatine tower, exempted ships bringing stone from all tolls, and contributed to the work the tithe of all the venison in his forests in Essex.

After the death of the latter of these prelates, who had applied the whole revenues of the episcopate to the work, the building was interrupted, and the choir was burned in 1135. When that was restored does not appear; but the consecration did not take place till 1240, or 225 years after the work had been commenced by Mauritius.

The dimensions of this noble temple, as taken in 1309, were as follow: The length 600 feet, the breadth 120, the height of the west part from the floor 102, and of the east part 188 feet. The height of the tower was 260 feet, and of the spire, which was made of wood, and covered with lead, 274 feet. The whole area occupied by the church was a little more than three acres and a-half, being one-third more than the ground covered by the present cathedral. It required enormous funds to defray the expense of erecting such an edifice. The several monarchs who reigned during the long time it was building, resigned their revenues arising from the customs or taxes on the materials, and furnished wood from the royal forests; the prelates also gave up much of their revenues, and, what proved a still greater resource, their payments for indulgences and for commutation of penance. The Pope gave a release from sixty days' penance, the Archbishop of Cologne a relaxation of forty days, the Archbishop of Canterbury forty days; and each prelate thus excited his flock to contribute liberally.

The church contained numerous shrines and altars, richly adorned; the high altar especially, which sparkled with gems and gold, was the gift of numerous votaries. John, King of France, when a prisoner, first paid his devotions at the shrine of St Erkenwald, and presented at it four basins of gold; and the gifts at the obsequies of princes, foreign and British, were of immense value. On the day of the conversion of the tutelar saint, the charities were prodigious, as well as other expenses. Thus, on one such occasion, by order of Henry III., fifteen hundred tapers were placed in the church, and fifteen hundred poor persons fed in the church-yard.

The sanctity of the place did not prevent thieves and profligates of all denominations from assembling within the precincts, and there committing, under favour of the night, murders and every sort of crime. Edward I. gave permission to the dean and canons to inclose the whole within a wall, and to have the gates shut every night, to exclude disorderly people. Within the walls was the bishop's palace, where several of our sovereigns were lodged, and sometimes the foreign ambassadors, with their retinue, were quartered in it. Before the cathedral, was the famous Paul's Cross, a pulpit of wood on stone steps, and covered with lead, from which eminent divines were appointed to preach every Sunday. The court, with the mayor and aldermen, and the principal citizens, resorted to the place, and sat in the open air, but the king and his train had covered galleries. It was not only used for preaching, but also for promulgating laws, issuing papal bulls, anathematizing sinners, exposing penitents under censure of the church, and denouncing those who had incurred the displeasure of the crowned heads. Before this cross Jane Shore, the concubine of Edward IV., was brought, divested of all her splendour, after which she fell a victim to the malice of crook-backed Richard. One of the best uses to which this cross was applied, was perhaps the sermon on the thanksgiving for the victory over the Spanish Armada, in the year 1588, which was preached by command of Queen Elizabeth. The last sermon delivered at the cross, was by Dr John King, Bishop of London, in the year 1620, in the presence of King James I. and his court. attended by the city dignitaries. The object of it was to collect contributions for the repair of the cathedral. The spire had been set on fire by lightning, in 1561, and it was designed by the sums thus collected to restore it. Inigo Jones was called upon to furnish plans; and, in 1633, some slight beginnings were made, not to replace the spire, but to make alterations in the style of the western portico. But in this, little progress was made, and the fire of 1666, which destroyed the whole magnificent pile, made way for the exercise of the talent and judgment of Sir Christopher Wren, who planned and completed the existing magnificent fabric.

That great artist, Sir Christopher Wren, brought to the construction the whole weight of a powerful mind, then in the full vigour of manhood, and every step was thoroughly examined before it was made. The foundation was first to be provided for; and, having found the former remains, he was induced from curiosity to dig deeper, till he came to a layer of hard and close pot earth. He found that, on the north side, it was six feet thick, that it became thinner towards the south, and on the decline of the hill was scarcely four feet. On advancing farther, he met with nothing but loose sand; at length he came to water and sand, mixed with the shells of periwinkles and other sea fish, and, by boring, came at last to the beach, and under that the natural clay, which evinced that the sea had once occupied the space upon which St Paul's now stands. This sand had been one of those sand-hills so common on the coast of Holland and Flanders, as well as on our own shores. It was the opinion of our great architect, that all the space between Camberwall Hill and the hills of Essex had been a vast bay, but at low water a sandy plain; all which appeared in some remote age to have been embanked, possibly by the Romans, who were much employed in that useful kind of work, *paludibus emuniendis.*

The foundation being secured, the next step was to prepare the plan of the intended temple; and in this, as in every part of the subsequent progress, nothing was done that was not preceded by the closest consideration. Sir Christopher made a model in wood of his first conception for rebuilding the church in the Roman style. In it he had an eye to the loss of the Pulpit Cross, and had supplied its place with a magnificent auditory within, for the reception of a large congregation. This was approved of by men of excellent judgment, but laid aside under the notion that it had not a sufficiently temple-like form. A second plan was then made, selected out of the various sketches which he had drawn. On this design Sir Christopher set a high value; but this also was rejected, when the third, which produced the present noble pile, was approved and executed.

The first stone was laid by Sir Christopher on the 21st of June 1675, and it was completed by him in 1710; but the whole decorations were not finished till 1723. It is remarked as a singular circumstance that the edifice was begun and finished under the same architect, by one Strange, the only master-mason, and during the episcopate of the same prelate, Dr Henry Compton, Bishop of London; whereas the church of St Peter's, at Rome, was one hundred and thirty-five years in building, during the pontificates of thirteen popes, and carried on by twelve successive architects.

Having thus compared the time occupied in building these two temples, we may also here compare their respective dimensions. The height of St Peter's, to the top of the cross, is 437 feet, that of St Paul's is 340 feet. The length of the former is 729 feet, that of the latter 500. The greatest breadth of St Peter's is 364, that of St Paul's 180 feet. Although Sir Christopher Wren was most intimately acquainted with the whole process of planning, and the progress of building St Peter's, he cannot be charged with having copied from that stately pile. The whole was the conception of the mind of our celebrated countryman, and is thus exclusively, both in the planning and the execution, whatever may be its merits or its defects, of native growth.

The church is surrounded with an iron balustrade, placed on a dwarf wall; and at the west end is an area in which is the statue of Queen Anne, and at the other extremity, within the same inclosure, are burying-grounds for some of the adjacent parishes. The whole of the church is built of stone brought from the Isle of Portland, in Dorsetshire, and is now very much discoloured by time, and the effects of coal smoke. The principal entrance is under a noble portico facing the west, consisting of twelve Corinthian columns, supporting a portico above it of eight columns, of the composite order. The history of St Paul's conversion is sculptured on the entablature. On the centre of the pediment is a statue of the patron saint, and at the sides are those of St James, of St Peter, and of the four evangelists. The base or floor of the church is gained by ascending twenty-four steps of black marble, where noble folding doors open into the church. The corners of this front are furnished with two turrets, with each a dome, terminating in a gilded pine-apple. The southern turret contains a powerful clock, and the northern contains a fine peal of bells.

The north and the south entrances correspond with each other in the style of their architecture, being domes supported by Corinthian columns, with steps to ascend in a semicircular form. The eastern end of the building is of a semicircular shape, richly ornamented with a great variety of fine sculpture. The floor is composed of alternate slabs of black and white marble, and is a level surface to the choir, without any rising, as is commonly the case in cathedrals. The floor of the altar is interspersed with porphyry, but neither in the choir, nor in any part of the decorations, does the interior of the church correspond to the elaborate magnificence of the exterior.

The entrances from the three doors meet where, (as the whole of the pile is in the form of a cross), the upright part of that figure is intersected by the transverse part, or nearer the east than the west end of the buildings. Over this is the magnificent dome supported by columns of such extent as to give a kind of heavy look to the whole interior, though they are not too large to harmonise with the great weight they support. Few objects strike the beholder more forcibly than this dome, when surveyed from the floor whence it rises. Some of the trophies of victory acquired during the wars in which the country has been engaged, are placed here, as well as at the west end of the cathedral, in honour of the marine and land forces by whom they were gained.

The dulness which, fifty years ago, appeared to the spectator standing under the dome, when he looked not upwards but around him, has been relieved by the monuments, all executed since that period, to the memory of the eminent men that have disappeared from the theatre of their renown.

It was not till 1790 that the thought was entertained of filling this part of the cathedral with the memorials of the mighty dead, whether celebrated for their learning, their virtue, their talents, or their bravery. The scheme was no sooner suggested than it was acted upon, and the first monument was soon afterwards erected to John Howard, the philanthropic visitor and improver of prisons and of hospitals. It was the work of the late Bacon, with an inscription from the pen of Samuel Whitbread, the second member for Bedford of that name. Since that time the events of war have much contributed to increase the number of these honourable and sacred memorials. They must be here noticed, but it would require a long dissertation to describe the characters of the individuals, to whose memory they have been erected, or the merits of the various artists to whom the execution of them was entrusted. The fine monument to Lord Nelson was the work of Flaxman. The following can be briefly noticed only:—Sir William Jones, by Bacon junior; Earl Howe, by Flaxman, and Sir Joshua Reynolds, by the same artist; Captain Hardinge, by Manning; Sir Ralph Abercromby, by Westmacott; Lord Rodney, by C. Rossi; Captain Westcott, by Banks; Sir John Moore, by Bacon; Lord Collingwood, by Westmacott; Captain Duff, by Bacon; Captains Moss and Riou, by C. Rossi; General Dundas, by Bacon junior; Generals Craufurd and Mackinnon, by Bacon junior; Dr Johnson, Marquis Cornwallis, and Lord Heathfield, by Rossi; General Picton, by Gahagan; General Ponsonby, by Baily; Captains Hutt and Burgess, by Banks; General Bowes and Colonel Cadogan, by Chantrey; Captains Falkner and Millar, by Hayman; and Generals Hay and Mackenzie, by Langworth.

Over the entrance to the choir is a marble slab, with a Latin inscription thus translated: "Beneath lies Christopher Wren, the builder of this church and of this city, who lived upwards of ninety years, more for the benefit of the public than of himself. Reader, if you seek for his monument, look around you." The crypt beneath the cathedral contains inscriptions to Wren, to Bishop Newton, to the painters Barry and Opie, and to some other individuals; but the chief object of attention is the tomb of Nelson, whose body rests there near to that of his friend Collingwood. Other illustrious persons have been interred there, to whom hitherto no memorials have been erected, nor is it known if any such designs are contemplated, viz. Alexander Wedderburne, first Earl of Roslyn; Sir John Braithwaite, Sir Joshua Reynolds, Benjamin West, Sir Thomas Lawrence, Henry Fuseli, George Dawe, and Sir John Rennie.

In the choir the cathedral service is daily performed. On Sundays there are two services; and on the first Sunday of each term it has been the custom for the Judges, and the Lord Mayor and Aldermen, to attend in the morning. This part has a fine organ, supported by marble pillars of the Corinthian order. The throne of the bishop, and the seats for the city corporation, are of curiously carved wood. The reading-desk is formed of the extended wings of an eagle of bronze, standing on a pillar, and surrounded with gilded rails. An early service is performed in a chapel near the north-west corner of the church, which begins at six in the morning in summer, and at seven in the winter. The ecclesiastical officers appertaining to this cathedral, besides the bishop, are the dean, the chancellor, the precentor, the treasurer, four canons residentiary, twenty-four prebendaries, and one layman, the chancellor of the diocese, which includes the whole of London, of the counties of Middlesex and Essex, and a part of Hertfordshire.

Within one of the pews a door leads from the floor of the church, by a winding stair-case of 280 steps, to the circular gallery, at the foot of the interior of the dome, commonly denominated the Whispering Gallery; a name to which it is entitled, by the increased intensity of sound within its limits. This increase is such, that a whisper may be communicated from a person on one side to another opposite to him in the gallery, though the distance is 100 feet, if the voice of one and the ear of the other be directed to the wall. The effect was not designed, nor was it discovered till after the building had been completed. The sound, on shutting the gallery-door, seems like loud thunder. From this spot the paintings in the interior of the dome may be seen to great advantage. They were from the pencil of Sir James Thornhill, and admirably pourtray all the most striking events in the life of St Paul, as narrated in sacred history.

From this gallery the passage is short to another, which on the outside surrounds the bottom of the dome, and is known by the name of the Stone Gallery, from which, being higher than any of the surrounding buildings, a good view, in clear weather, may be obtained of the whole city and suburbs. From this point there is a further ascent of 254 steps in a number of staircases, or rather ladders with rails, to the upper exterior or the golden-gallery. As the way from one to the other passes through a vacancy left between the interior and the exterior dome, it is dark, and to those who first enter upon it alarming, but the guards against danger are quite sufficient to protect those who ascend. From the height of the golden gallery the view is necessarily more extensive, and comprehends the adjacent country to the hills of Hampstead to the north, and those of Surrey to the south; whilst the course of the river, both up and down, may be distinctly traced. Above this gallery is the ball and cross. These parts had been so affected by their weight, and the length of time they had been exposed to the influence of the weather, that fear was entertained for their safety. In 1822 they were taken down, and replaced by other ornaments of the same figure and dimensions, but of more appropriate materials, which were also of less weight. The whole, therefore, is now in a safe state. The present, like the old ball, measures six feet in diameter, and is capable, with squeezing, of containing eight persons, who may go there with safety, but they scarcely see more than they would in a covered copper boiler.

Nearly on a level with the whispering gallery, over the south aisle of the nave, is the library, furnished with a collection of books by Bishop Compton; but most remarkable on account of the curious floor, consisting of more than two thousand pieces of oak, curiously laid together, and for a most beautiful geometrical flight of steps.

The mechanical works in the southern turret, over the west end of the church, are curious and interesting. The great clock has a pendulum fourteen feet in length, and the weight, whose descent gives motion to the clock, is of one hundred pounds. The length of the minute-hands of the dials is eight feet, and of that of the hour-hands five feet five inches. The diameter of the dials is eighteen feet ten inches, and the length of the figures that indicate the hours two feet two inches and a half. The loud and clear-sounding bell which strikes the hours has been heard and distinguished at two miles distance, and, when the weather is clear, can be distinguished from all others in the metropolis. It is about ten feet in diameter, and weighs four tons and a half. It is never tolled except on the death of any member of the royal family, of the Lord Mayor or Bishop of London, er of the Dean of the Cathedral.

In the cathedral two meetings are annually held, which excite great interest, and usually attract considerable crowds of spectators and auditors. The first is that of the children of the several parochial charity-schools of the metropolis. These are marched under the care of their teachers, and placed in temporary galleries, rising above one another under the dome, presenting the gratifying spectacle of from eight to ten thousand children of both sexes, neatly clothed, who are receiving gratuitous instruction. Divine service is performed, and a sermon by some eminent divine is preached, when the whole of the children join in singing the hundredth psalm to Luther's noble tune, the effect of which is uncommonly interesting and beautiful. The day finishes with a collection for the schools and the occasion.

An annual assemblage held in St Paul's, is intended to support the charitable institution for the benefit of the sons of the clergy. Handel's grand Dettingen Te Deum, with some of his most beautiful choruses and appropriate anthems are performed by a powerful orchestra, supported by the principal gentlemen, both lay and clerical, belonging to the three choirs of St Paul's, Westminster Abbey, and the Chapel Royal, who make a point of attending and of performing gratuitously. A rehearsal precedes the grand performance; and at both very large sums are obtained as contributions to the benevolent institution.

Some of the dimensions of the cathedral have been already stated, and the others are as follow. The breadth from north to south, at the transept, is 285 feet; the height, exclusive of the dome, is 110 feet; the circuit 2292 feet; and the ground it covers 2 acres 16 perches and 70 feet.

In the reign of James I. and of Charles I., the body of the cathedral was the common resort of the politicians, the newsmongers, and the idlers of the day. It was called *Paul's Walk*, and the frequenters known by the name of Paul's walkers, as is mentioned in old plays and other books of that time. The *Microcosmographia*, printed in 1626, gives a ludicrous description applicable to the cathedral, and illustrative of the manners of London, which is worth inserting here in the quaint phraseology of the period. "It is the land's epitome, or you may call it the lesser ile of Great Britaine. It is more than this, the whole world's map, which you may discerne in its perfectest motion, justling, and turning. It is a heap of stones and men, with a vast confusion of languages, and, were not the steeple sanctified, nothing liker Babel. The noise in it is like that of bees, a strange humming or buzze, mixed of walking tongues and feet. It is a kind of still roare, or loud whisper. It is the great exchange of all discourse, and no business whatsoever but is here stirring and afoot. It is the synod of all pates politicke, jointed and laid together in the most serious posture; and they are not half so busie at the parliament. It is the anticke of tailes to tailes and backes to backes; and for vizards, you need go no further than faces. It is the market for young lecturers, whom you may cheapen here at all rates and sizes. It is the general mint of all famous lies, which are here, like the legends popery first coyn'd and stampt in the church. All invertions are emptyed here, and not few pockets. The signe of a temple in it is the thieves sanctuary, which robbe more safely in the croud than a wildernesse, whilst every searcher is a bush to hide them. It is the other expense of the day, after plays, taverne and a baudyhouse; and men have still some oathes left to sweare here. It is the ears brothell, and satisfies their lust and ytch. The visitants are all men without exceptions; but the principal inhabitants and possessors are stale knights and captains out of service; men of long rapiers and breeches, which after all turne merchants here, and trafficke for newes. Some make it a preface to their dinner, and travell for a stomacke; but thriftier men make it their ordinary, and board here verie cheape. Of all such places it is least haunted with hobgoblins, for if a ghost would walk, move he could not."

Westminster Abbey.

The ancient history of this magnificent pile is necessarily involved in the common obscurity of remote ages. If any credit can be given to tradition, it stood originally on an island in the Thames, called Thorney Island. But if it was once an island, it must have been by the stream dividing, and one branch of it, above Millbank, running in a direction towards the spot where the Chelsea water-works now stand, from thence by Pimlico into the Park, and then rejoining the other branch somewhere about Scotland Yard. Another tradition places it on the site of an ancient heathen temple dedicated to Apollo. Having barely noticed these reports, we come to a period more within the compass of accurate history. Wedmore, who was a man of great learning, and examined all the extant records, fixes the date of the abbey and buildings between the years 730 and 740. It was in all probability injured if not destroyed by the Danes, for it was rebuilt by King Edgar, at the urgent suggestion of Dunstan, and by him appropriated to the order of the Benedictines, with sufficient endowments for the support of twelve monks.

In the turbulent times that followed the reign of Edward the Confessor, it was injured by the sacrilegious fury of contending parties, which induced that pious monarch to renovate and improve it. The Norman style of architecture was adopted, as appears from fragments of the building which were recently in existence, and from a few which still remain. Considerable revenues were established for the monks by the king, and the nobles, stimulated by him, contributed largely. During the incumbency of the Abbot Lawrence, about the year 1159, many repairs were executed on the out-buildings, and the roof, which had suffered severely, was replaced by a new one, and for the first time covered with lead.

The whole building was, however, taken down and rebuilt by the same prince. It was begun in 1425, but not finished till fourteen years later, after his decease. An accidental fire destroyed the roof, but by the contributions of the king, of the monks, and of other pious persons, it was repaired, and restored to the beauty and splendour which it still displays. A chapel was added at this time, on the spot where now stands the curious specimen of the Gothic architecture of its age, known by the name of Henry VII.'s Chapel, it having been built in the reign of that prince, who laid the first stone of it on the 24th of January 1502. His design was to preserve it as a burying-place for himself and the other members of the royal family.

During the long interval between the death of Henry VIII. and the accession of William and Mary, little care was taken to preserve this ancient edifice. It had been somewhat defaced in the civil wars, and generally neglected afterwards; but soon after the Revolution, the parliament voted a considerable sum for the reparation, and Sir Christopher Wren was appointed the architect, to superintend the expenditure. The defective parts were then duly repaired and strengthened, and two new towers were erected, which, by some critics, have been thought not to harmonize with the general structure, which is Gothic, whilst the towers are decorated with Roman ornaments.

The principal object of attention in the exterior, with the exception of the towers and of Henry VII.'s Chapel, is the magnificent Gothic portico leading into the north cross, or Solomon's gate, which has been adorned by a window of modern design, admirably executed.

In the interior, the Gothic arches separating the nave from the side-aisles are supported by forty-eight pillars of grey marble, and are so disposed that the whole body of the church may be seen on entering the western door, which has a most commanding appearance.

The choir is of less ancient date than other parts. It is in the Gothic style, and it is divided from the nave by an elegant screen of stone, erected from the designs of Mr Blore. The altar-piece is of ancient workmanship renewed; and the Mosaic pavement in front of it is also very curious, said to have been executed by Richard de Ware, formerly Abbot of Westminster.

On the northern side of the choir are some monuments which deserve notice, chiefly on account of their antiquity. These are to the memory of Aymer de Valence, Earl of Pembroke, and his countess, and of Edward Crouchback, Earl of Lancaster; and on the south are two, remarkable for the same reason, to Sebert, the original founder of the abbey, and to Anne of Cleves.

The roof of the lantern, which was destroyed by an accidental fire in 1803, has been rebuilt, but in a style better harmonizing with the rest of the building than the one which preceded it, and is now richly adorned with carving and gilding.

There are within the structure several chapels, all of which will reward the antiquary for the time occupied in their inspection. Two of them pre-eminently require some description. The chapel of Edward the Confessor is at the east end of the choir, and contains the shrine of that monarch, a piece of workmanship affording a fine specimen of the skill of the age in which it was executed, that of Henry III. In this are the tombs of Editha, the Queen of Edward, of Henry III., of his son Edward I., and several other royal personages. Here are preserved the iron sword of Edward I., and a part of his shield, and the coronation chairs. The most ancient of these chairs was brought from Scone, in Scotland, with the other regalia of that kingdom, by Edward I. in 1297, and has been used at the coronation of all our kings to the present time. The other chair was constructed for the coronation of Mary, the wife of William III. The skreen of this chapel is adorned with several statues, and with various legendary hieroglyphics respecting the Confessor, executed in basso-relievo.

The chapel of Henry VII. was commenced in 1502, and was executed, according to some, under the direction of Sir Reginald Fox, or, according to others, by Bolton, the Prior of St Bartholomew's. It is built of Yorkshire stone, and the expense of it is said to have been L.14,000. It is at the eastern part of the abbey, and constructed in the florid Gothic style. The exterior is adorned with fourteen octagonal towers jutting from the building in different angles, and ornamented with exquisite sculpture. A thorough repair of it was executed between the years 1810 and 1822, for which parliament voted the sum of L.42,000.

The steps by which the ascent to the chapel is gained are of black marble, under a portico which is at the entrance, with gates of brass, most curiously laboured. The lofty stone ceiling contains a variety of figures. The stalls for the Knights of the Bath are of wood, now of a deep brown colour, with Gothic canopies beautifully carved, and the seats of the esquires to the knights correspond in their workmanship, and are all ornamented with curious devices. The pavement is of black and white marble. The banners of the knights project over the stalls, and the whole has a most imposing effect. On entering, the tomb of the founder and the brass chapel present themselves, and at the end are the chapels of the Dukes of Richmond and Buckingham of past ages. The windows were formerly of painted glass, and in each pane a white rose, the badge of the royal house of Lancaster. The roof is nearly flat, and is supported on arches between the nave and the side aisles, which are turned upon twelve Gothic pillars, curiously adorned with figures, fruit, and foliage.

The chapel was destined to the sole purpose of interring the members of the royal family; and the rule has been adhered to so far, that none but those of the blood-royal have found a sepulchre within the vaults beneath it. In the north and south aisles of the chapel are many monuments to royal and noble persons; in the former, that of Edward V., of Queen Elizabeth, of Mary Queen of Scotland, and some others; and in the latter, of Monk Duke of Albemarle, of Margaret Countess of Richmond and Derby, mother of King Henry VII., and many others.

In both the naves, at the west end, and in Poet's Corner, are numerous monuments to princes, nobles, statesmen, land and sea warriors, divines, lawyers, philosophers, historians, poets, painters, sculptors, musicians, dramatists, and others, distinguished for their rank, virtue, valour, patriotism, learning, or taste; a list of which, with due notices, however short, would fill a volume.

Besides the church, many of the ancient appendages of the abbey remain, such as the cloisters, filled with monuments, in a quadrangle, with piazzas around it; the chapter-house, now filled with ancient records, amongst which is a fine copy of Doomsday-book, still in excellent preservation, whose leaves are only allowed to be turned over by silver tongs; the crypt beneath the chapter-house, the roof of which is supported by plain ribs, diverging from a short round hollow pillar, and having walls eighteen feet in thickness; and the residence of the Dean, and of the several ecclesiastics attached to the church, who assist daily in the public service in the choir.

Not far from the abbey stood the sanctuary, the place of refuge once granted to criminals of certain classes. The church belonging to it is supposed to have been the work of the Confessor. Edward V. was born within the precinct; and here his unhappy mother took refuge with her younger son Richard, to secure him from his cruel uncle. Near to it was the almonry, where charity was dispensed; but it is more remarkable as being the place in which the first printing-press was established in England, by William Caxton, in 1474, and where the first English book was printed, written, according to tradition, by Thomas Milling, then abbot, and entitled "The game and play of the Cheese."

The length of the abbey, exclusive of Henry VII.'s chapel, is 416 feet on the outside, and 383 within. The west towers are 225 feet in height. The breadth of the church at the transept is 203 feet, the height of the nave 102 feet, the length of the choir 156 feet, and the breadth of it 28 feet.

The clergymen belonging to this church are the dean, eleven prebendaries, a precentor, and a chapter clerk, and besides these there is an organist, and an establishment of choristers.

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e.

There is an establishment neither strictly to be classed as ecclesiastical, nor with one of the hospitals, for the cure of the diseased, but deserving notice, which may be given to it in this part of the article. The *Charter-House* is in a small square of the same name near to Smithfield. A house for Carthusian monks, founded by a Sir Walter Many, a successful officer in the wars with France under Edward III., gave to this establishment its existence, and (with a slight change) its name about the year 1349; it is situated on a piece of ground which he had purchased for the interment of those who had died of the plague, to which, according to some, fifty thousand, and according to others one hundred thousand had fallen victims. Ralph Stratford, Bishop of London, bought another piece of ground adjoining, on which he built a chapel, and inclosed a burial-ground called Pardon Church-yard, in which criminals and suicides were buried.

The Carthusians regulated these premises till the suppression of monasteries, when there were twenty-four monks of that rigid order. Though the last prior acknowledged the king's supremacy, this did not save the institution. It was seized with others, and then granted to persons who sold it to Thomas Duke of Norfolk, who again disposed of it to a charitable individual Thomas Sutton. This man, possessed of vast wealth, and devoted to beneficent purposes, converted his purchase into a magnificent hospital, consisting of a master, a preacher, a head and second master, with forty boys, and eighty decayed gentlemen, who had been soldiers or merchants, besides physician, surgeon, and registers. 'Having, in the reign of James I., obtained an act of Parliament for the purpose, he endowed the institution with L.20,000 in money and landed estates of the annual value of L.4500.

Scarcely any of the ancient conventual buildings are now standing, but the present pile was chiefly erected by the Duke of Norfolk before he had sold it to Sutton. The chapel is a venerable edifice with Gothic windows, in which, in painted glass, are the arms of the founder. The house of the master is a curious suite of rooms. The old court-room is richly decorated with carving and pointing. The library, the gift of a Mr Wray, is a fine old collection.

This charity is under the government of trustees, who are usually selected from the ranks of the most eminent public men of the country. They have the appointment of the masters, physician, surgeon, chaplain, and other officers, who, besides their salaries, are provided with residences and other conveniences.

This has become one of the first classical schools in the kingdom. Besides those on the foundation there are many other scholars, who board in houses near it, in which some of the junior teachers superintend their conduct whilst out of school hours. The number of such scholars has varied much, according to the supposed aptitude of the master for the time for communicating instruction. The youths educated at the Charter-House upon the foundation have exhibitions at the university; and the hospital having the patronage of nine livings, those educated in it have the preference in the presentations.

hes.

As it is not possible in this work to notice all the numerous churches in the metropolis, and as a selection of those most remarkable must be made, it seems best to begin that selection by some of the sacred edifices in Westminster, where they are generally larger than those in the city, and where the number of them is in a much less proportion to the population than in the eastern division of London.

The church of *St James*, in Piccadilly, was built in the latter part of the reign of Charles II., but was not consecrated till the accession of his brother James. The great extension of London made new churches desirable, and a part of the parish of St Martins-in-the-Fields was separated from it, and attached to this new erection. It was built on a piece of ground where the house of the gay Henry Jermyne, Earl of St Albans, the favoured lover, perhaps the secret husband, of Henrietta Maria, the widow of Charles I. formerly stood. It was built by Sir Christopher Wren, partly of stone, and parly of brick. It is well proportioned, being 85 feet long, 60 broad, and 45 high; and, having deep galleries on both sides and at the end, it is adapted for a large audience. The most remarkable object in the church is a fine font of white marble, the work of Granlin Gibbons. It is supported by the tree of life; the serpent is offering the forbidden fruit to our first parents who stand beneath; on one side is engraved the Baptist baptising our Saviour; on another St Philip baptising the Eunuch; and, on the third, Noah's dove bringing the olive branch, the symbol of peace to mankind. The chancel above the altar is enriched by some beautiful foliage in wood by the same great artist. The living is a rectory, and the right of presentation to it is vested in the Bishop of London at present; Lord Jermyn had one turn in three, but conveyed it to the episcopate. The pulpit of this church has been occupied by some of the most pious and learned ministers of the established church, who have been successively the rectors.

Church of *St Martins-in-the-Fields*. This building was erected in 1721, on the site of an ancient church, said to have been constructed 500 years before. It is remarkable for its magnificent façade, with a portico of eight Corinthian columns, which is seen to great advantage as the termination of the long street of Pall-Mall. It is 140 feet in length, 60 in breadth, and 45 in height, being furnished with deep galleries, and with seats in the aisles; it will accommodate 3500 persons. The interior is handsome, and the decorations fine, but at present they need both painting and gilding. The ceiling is elliptical, which is deemed favourable for hearing. Near to it is the vicarage-house, recently built at the sole expense of Dr Richards, the late vicar, in a superior style. The tower is lofty and handsome, and contains a peal of twelve bells. Around it, under the pavement, are some recently constructed catacombs finished in 1830, and the parish has besides a burying-ground at Camden Town.

Church of *St John the Evangelist* at Milbank, Westminster. This is one of the churches built in the reign of Queen Anne, by Sir John Vanbrugh, the successor of Sir Christopher Wren. It is a singular building, too much incumbered with ornaments. On the north and south sides are porticos supported by massive pillars, and at each of the four angles is a stone tower with a pinnacle. The front is an elegant portico, supported by Doric columns, which order is continued in pilasters round the building. The interior was much improved in 1825, and it is now lighted with gas. It is 140 feet in length, 90 in breadth, and 50 in height, and can accommodate 2500 hearers. Over the altar is a painted window representing our Saviour's descent from the cross, and the Apostles St John and St Paul.

Church of *St Georges*, Hanover Square. This edifice was erected in 1724, being one of the fifty built under the act passed in the reign of Queen Anne; but the ground on which it stands was presented to the parish by the liberality of General Steward, who bequeathed L.4000 for the purpose. Next to St Martins-in-the-Fields, it is the handsomest church in London. The fine portico consists of six Corinthian columns, with an entablature and pediment;

but from being in a street, it is not seen to the greatest advantage. The steeple is very magnificent. The interior is executed with more expense than taste. The altar-piece, painted by Sir James Thornhill, represents the Last Supper. The church is 100 feet in length, 60 in breadth, and 45 in height, and can accommodate 2500 hearers. This parish has also a church at Pimlico, and a burying-ground near Tyburn turnpike.

Church of *St Margaret.* This building is placed in such a situation as to impede the view of Westminster Abbey, and by contrast with that edifice, to appear less worthy of notice than it would be in another situation. It is the church of the House of Commons, with a pew for the Speaker, and a gallery for members. On this account it has often been repaired at the public expense, and its decorations and ornaments are of great value. On the altar table is a basso-relievo, representing Christ at Emmaus. There is a fine painted window, prepared at Dort in Holland in the reign of Henry VII., representing the crucifixion. The church is 130 feet in length, 65 in breadth, and 45 in height, and accommodates 2000 auditors. In one of the aisles is a tablet to the memory of Sir Walter Raleigh, who was buried there. In the enclosure by the church, a bronze statue to the memory of Mr Canning, by Westmacot, has been erected.

St George's Church, Bloomsbury, was one of the fifty ordered to be built in the reign of Anne, but it was not finished till 1731, when the statue of George I. was placed on the top of the tower. It was built by Hawksmoor, and, contrary to the general practice, extending from north to south. It has an admired portico of eight Corinthian columns. In it are some handsome monuments, especially one to the late Charles Grant, constructed at the expense of the East India Company. The church is 110 feet in length, 90 in breadth, and 50 in height, and can accommodate 2000 auditors.

The church of *St Mary-le-Strand* was built by Gibbs, under the act of Queen Anne, and completed in 1717. It is an elegant pile of architecture, with an entrance at the west end by a flight of steps in a circular form, which leads to a portico of Ionic columns covered with a dome, and the columns in the same order are continued in pilasters round the whole building, and in the intercolumniations are niches tastefully ornamented. It is 70 feet in length, 30 in breadth, and 48 in height, and has a modern painted glass window.

St Clement Danes Church, in the Strand, was built in 1680 by Sir Christopher Wren. It is built of stone, with two rows of windows, the lower plain, but the upper ornamented; and the termination is by an attic. On the north, as well as on the south side of the front is a portico with a dome, supported by Ionic columns. The steeple, which is lofty and beautiful, was erected by Gibbs in 1719. The church is 96 feet long, 63 broad, and 48 high. Both these churches are inconveniently placed, as the noise, from the constant succession of carriages passing close to them, prevents the distinct hearing of the preacher's voice.

The church of *St Anne*, Soho, in Dean Street, was built in 1685, on account of the great increase of inhabitants in the parish of St Martin's-in-the-Fields, of which this district then formed a part. It received its name from the Saint, in compliment to the then Princess Anne of Denmark, who afterwards became Queen. It is a brick building, 110 feet long, 60 broad, and 40 high, and is rendered singular by a circular tower, surmounted by a large ball, containing a clock with four dials. There is a fine organ, a present from King William III., and two paintings of Moses and Aaron around the tablets on which the decalogue is painted. At the back of the church is a tablet in remembrance of Theodoric, King of Corsica, who was interred there.

The most remarkable of the churches in the western part of the metropolis that have been opened within the last eighteen years are the following:—

All Souls Church, in Langham Place, is a beautiful but singular structure, erected in 1824, from the designs of Mr Nash, and contains space for 1800 persons. The steeple consists of a circular tower, surmounted by a cone. The tower rests on a flight of steps, and the lower part is surrounded by a peristyle of twelve Ionic columns, the capitals of which are profusely ornamented. The base of the cone is also surrounded by a peristyle consisting of fourteen Corinthian columns, supporting an entablature and balustrade. The cone is fluted and carried to a point, without the usual addition of either weathercock or vane. The interior is very pleasing; three sides are occupied by galleries, and the fourth by the altar, which is adorned with a painting by Westall, of Christ crowned with thorns. Above the front of the galleries rises a colonade of Corinthian columns, supporting the ceiling, which is enriched with sunk panels.

The new church of *St Luke's*, Chelsea, which was consecrated on the 28th of October 1824, is one of the most beautiful edifices, in the Gothic style, that has been produced of late years. It is built of brick but faced with stone, and is divided into a nave and aisles. At the east end is a large window and splendid altar screen; and at the west end is an organ, built by Nichols. The church is 130 feet long, 61 wide, and 60 high, and it accommodates 2000 persons conveniently. It has a handsome tower with pinnacles at each angle, the height to the top of which is 142 feet. In it is an excellent peal of bells. The architect of this work was Mr Savage.

Marylebone New Church, in the New Road, was originally designed as an additional chapel of ease to the parish; but when the interior had been fitted up and arranged, it was so much admired, that it was thought expedient to make it a parish church. A small stone cupola, which had been erected, was taken down, and the present tower, adorned with representations of the winds, substituted. The front was increased in length; and the portico of six Corinthian columns, was tastefully attached to the building. The interior is rendered remarkable by a double gallery. The organ is over the altar, and stands at the south end of the church; and a picture, by West, of the nativity, forms the altarpiece. The foundation was laid in July 1813, and the consecration was performed in February 1817. The length of the church is 125 feet, the breadth 70, and the height 53. The height of the tower is 154 feet, and the width of the portico 20 feet. The builder was Mr Hardwicke. At this church more than three thousand baptisms are annually performed.

Christ Church, in Woburn Square, is an elegant edifice, completed in 1833. It is in the style of the architecture which flourished in this country in the fourteenth and fifteenth centuries. The principal front has a tower, which is united to a spire 150 feet in height. There are five entrance doors in the front, and the same number of windows, with mullions and rich tracery over them. The interior, calculated for 1500 persons, is a square of 70 feet each way, and has an height of 48 feet. Four massive pillars form a transept, and support arches; the arms of the transept being equal to the length of the nave, and thus a Greek cross is described. The great east window is enriched with mullions and elaborate tracery, and being 28 feet by 13 becomes an important feature in this elegant church.

The new church of *St Pancras* was consecrated in May 1822. It is built of brick, but faced with Portland stone, and the design of it by Mr Inwood, is in imitation of the Temple of Erectheus at Athens. The portico is a beautiful object, consisting of six Ionic pillars, beneath which are three doors, the centre of which is an exact representation of the entrance to the Greek temple. At each end of the church are two projecting wings, designed for the registry and vestry room, and formed on the model of the Pandroseum, which was attached to the Temple of Erectheus. The steeple, which is 160 feet in height, is also from the Athenian model, being an imitation of the Temple of the Winds. The interior, which is 170 feet in length, and 60 in breadth, is particularly elegant, the windows being composed of ground-glass, with coloured borders; and the galleries supported by pillars taken from casts of the Elgin marbles.

The church of *St Giles'-in-the-Fields*, was erected in the year 1730, on a spot where formerly stood an hospital, in the front of which Sir John Oldcastle was burned for his religious opinions in the reign of Henry V. It is a fine building, with a tower at the west end of the Doric and Ionic orders, terminated by a steeple, the clock of which is now illuminated at night. The ceiling is arched, and supported by Ionic pillars. At the north-west corner of the churchyard is a handsome portico called the Resurrection Gate, having over it a fine bronze representation of that expected event executed about 1687.

St Stephen's, Holborn Hill, is one of the churches built under the direction of Sir Christopher Wren in 1670. It is 126 feet in length, exclusive of the ambulatory at the west end, is 58 feet in breadth, and 35 in height, and calculated for 2000 auditors. The tower is 140 feet in height, with four modern spires at the angles. The altarpiece, of the Corinthian order, and the roof, supported by twelve Tuscan pillars, produce a very fine effect.

St Peter's Church, Pimlico, is a chaste building of the Ionic order, erected in 1826 from the design of Mr Hakewell. The portico consists of six fluted columns, supporting a pediment, behind which is a quadrangular tower, crowned with a spherical dome and cross, and has a fine effect. It accommodates 1680 persons. The altar-piece s Christ crowned with thorns, painted by Hilton.

The churches in the city, though more numerous than n the other parts of the metropolis, are in general much smaller, and so are the congregations; for in some parishes so many houses have been taken down in order to erect public buildings, and so many of the more substantial tradesmen and merchants prefer to live either in the country or at the west end of the town, rather than at their houses of business, that but few in comparison attend the parish churches, whilst those churches in the more fashionable or more pleasant parts are in general crowded to excess, especially if the preachers are at all popular.

Christ's Church, in Newgate Street, is one of the largest of the city churches. It was built by Sir Christopher Wren on the site of a former church, which, before the Reformation, had belonged to the Franciscan monks. It s a beautiful structure, but hidden by the houses that surround it. The tower is square and lofty. The pulpit is curiously carved with representations of the Last Supper, and of the four evangelists. The font is of white marble, adorned with *alto relievos*. The western window is ornamented with the royal arms and painted glass. The number of eminent persons interred in the vault is very great. Annual sermons are preached here at Easter before the Lord Mayor, Aldermen, and the Governors of royal hospitals, known as Spital sermons.

The *Church of St Mary-le-Bow*, or *Bow Church*, in Cheapside, was built by Wren in 1673, upon the spot where a very ancient one stood built on arches, from which t derives the addition to its name. The tower is very beautiful, being 200 feet in height, and furnished with a very celebrated peal of bells; and was in 1820 improved and strengthened. The Bishop of London is consecrated here, and the lectures are preached in pursuance of the will of Mr Boyle, in defence of the Christian religion, many of which have been published and maintained the highest rank amongst theological writings.

St Dunstan's in the West, in Fleet Street, was one of the oldest churches in London, and none more attracted the attention of passengers, owing to its clock, at which appeared two coarsely clad athletic figures with clubs in their hands, who struck a bell to give notice of the hours and quarters of hours. These have been sold to the Marquis of Hertford, with their machinery, to ornament his villa in the Regent's Park. The sale was made when the church was rebuilt in 1834. It is now a handsome Gothic edifice, but placed thirty feet farther back than before. The southern front is a tower of freestone, square as high as the belfrey, which is lighted by four large windows. Above these windows an octagonal battlement, springing from corbelled heads, surmounts the tower, the four corners of which are ornamented by pinnacles; and thence rises an octagonal lanthorn, each angle having a buttress and fencal, and each front two windows, one above the other; the whole being terminated by a richly-ornamented crown parapet. The entrance doorway is finished with rich tracery, and flanked by two buttresses. The arms of the kingdom and of the city are placed upon each side of it, and four blank shields over it; an iron rail and gate separating the whole from the street. The interior of the church is appropriately finished in a style harmonising with the exterior, and the ornaments are extremely rich. The total height of the tower is 130 feet. The accommodation provided is for about 900 persons. The whole well deserves notice, and does great credit to the skill and taste of the architect, Mr John Shaw, who died just as the work was finished.

The church of *St Saviour*, in the Borough of Southwark, belongs to two parishes, St Margaret's and St Mary Magdalen. It was formerly a priory, but, from various repairs, little of its original architecture remains. It is, however, a noble fabric, with three aisles running east and west, and a cross aisle. It measures 270 feet in length, 54 in breadth, and 47 in height; and the breadth of the cross aisle is 109 feet. The tower, which is surmounted by four pinnacles 150 feet high from the ground, is remarkable as the spot from which Hollar took his views of London, both before and after the great fire. The *Lodge Chapel*, at the east end of this magnificent church, and which forms its most interesting part, had undergone some insufficient repairs, and being still dilapidated, it was proposed to pull it down, to avoid the great expense which was deemed necessary to preserve it. This project having been opposed by many of the admirers of our Gothic architecture, a successful appeal was made to the public in order to raise the funds necessary to save it from destruction. The necessary sum having been obtained, the work is now proceeding with great rapidity, every part being made an exact *fac-simile* of the original fabric. By an act of Parliament of the session 1833, an additional width was given to the opening in the main street leading from the new bridge, which is now such as to display the whole of the fine church of St Saviour to the greatest advantage.

The church of *St Stephen's*, Walbrook, though but little known, is considered by critics as the best specimen of the taste of Sir Christopher Wren, who built it after the fire, according to a design borrowed from the celebrated Palladio. The plan is original, but chaste and beautiful. The dome, supported by eight arches, springing from eight Corinthian columns, is light and scenic in its effect, and scarcely corresponds with the simple solemnity of our religious worship. Over the altar is a fine picture representing the interment of St Stephen, by West. The church is 75 feet long, 36 broad, and the central roof 34 feet high.

The great number of the churches in London forbid even an enumeration, but it may be confidently affirmed that, varying as they do in age, in style of building, in decorations, and in extent of accommodation, all of them are kept in excellent order, as regards cleanliness, neatness, and warmth, and have the service performed with punctual adherence to the prescribed formularies.

The new churches and chapels which have been built or rebuilt under the direction of the commissioners for building churches, from sums partly raised by voluntary contributions, and partly from the aid supplied from the Parliamentary grant, are as follow:—

	Opened in
Trinity Church, Newington Butts,	1823
St John the Evangelist, Waterloo Road,	...
St Mary's Wyndham Place, Bryanston Square,	1824
St Peter's, Rivington,	...
All Saints, Poplar,	...
Hanover Chapel, Regent Street,	...
Regent Chapel, Sidmouth Street,	...
Somer's Town Chapel,	...
Camden Town Chapel,	...
Christ's Church, Marylebone,	1825
St John's Hoxton,	1825
Bethnal Green,	...
St Barnabas, near Goswell Street,	1826
Trinity Church, Marylebone,	...
St Mary's, Haggerstone,	...
St Peter's, Pimlico,	...
St Paul's, Ball's Pond,	1826
Trinity, Brompton,	...
St Mark's, Clerkenwell,	1828
North Audley Street Chapel, or St Mark's,	...
St Philip's, Regent Street,	...
Trinity Church, Sloane Street,	...
St Andrew's, Saffron Hill,	1831

All of these are capacious buildings, capable of accommodating from 1500 to 2200 hearers each, and about two-thirds of the sittings are free to all persons. The total number of churches of the established religion in the metropolis, according to the limits here presumed, is 149, and of chapels 88. These 237 buildings may, on an average, accommodate about 1200 persons in each; for though a few of the older churches are small, yet the vastly greater capacity of some of the old, like St Martin's and others, and all the new, and those in Westminster of all ages, more than compensate for the narrow limits of the more ancient edifices. There is thus church accommodation for 255,000 persons.

Other places of worship.

Besides these structures destined for the national church, there are numerous buildings appropriated to the various sectaries who prefer other modes of worship, or adopt different professions of faith. As they are varying bodies, it is difficult either to estimate the number of their places of worship, or to classify them with much confidence of accuracy. Though the buildings occupied by dissenting congregations are for the most part neat and commodious, few of them have that imposing exterior which demands attention; and many of them are in courts, or lanes, or narrow streets, or in the outskirts of the metropolis.

There are two, however, sufficiently distinguished from the rest to merit notice. The Roman Catholic church in Moorfields, a modern structure of great capacity, is a plain building, but ornamented with paintings which produce a fine effect. The altar is adorned with marble columns, and there is a fresco painting of the Crucifixion, on which the light from behind is thrown so as to produce a fine effect. On the ceiling are representations of the Virgin Mary, of the infant Jesus, and of the four Evangelists, surrounded by paintings of the principal events in the life of our Saviour, all executed by M. Angelo, an Italian artist.

The members of the Established Church of Scotland resident in London have lately erected an edifice for the celebration of their form of worship in Regent's Square, near to Gray's Inn Lane. The building is in the Gothic style, and may vie with most of those lately built for the English church. It is 100 feet in length, and 63 in breadth, and is capable of containing 1800 persons. It is after a design of Mr Tile, and well executed.

The number of places of worship, other than those of the Established Church, is 207, of which 16 belong to foreign Protestants, Dutch, Danish, Swedish, French, Swiss, or German, and they are both of the Lutheran and of the Calvinist communion. The Roman Catholics occupy seventeen chapels, four of which belong properly to foreign ambassadors. The Jews have six synagogues. The others are used for the public worship of the various descriptions of Protestants. Twelve of these are of the Scottish nation, and presbyterians either of the Established Kirk, or of some of the secessions from it. The Wesleyan Methodists, including the different branches into which the sect is divided, have seventeen chapels. The Whitfield Methodists, or those of Lady Huntingdon's connexion, possess five chapels. The Quakers, or Friends, occupy six meeting-houses. There are eighty-eight chapels denominated Calvinist, many of which are Independent, and some few Presbyterians, but the most are occupied by congregations collected by some popular preacher, who do not make any specific opinions a centre of union, and have little connexion with each other. There are forty-four meeting-houses of Baptists, comprehending both Arminians and Calvinists, but the latter are by far the most numerous; in some of these the service is performed in the Welsh language. The Arians and Socinians, calling themselves Unitarians, have eight chapels. There are, besides, small chapels used by Swedenborgians, Sandemamonians, Huntingdoneans, Moravians, and Free-thinking Christians, but not more than one to each sect. As many of these chapels are very small, and only a few of them large, they do not probably upon an average provide room for more than half the number of auditors that can be accommodated in the churches and chapels of the established faith. It is doubtful, if taking one with another, they include more than 500 persons each.

Institutions connected with religion.

The religious zeal of the metropolis is not more evinced by the regard paid to the edifices of devotion than it is by the anxiety displayed by numerous societies formed for the promotion of piety and virtue. These are of various descriptions. The distribution of Bibles and other pious writings is the express object of some of these associations. Of these two are pre-eminent by their extent. One of them, called the Society for Promoting Christian Knowledge, consists of members of the National Church, and disseminates the sacred Scriptures, the Book of Common Prayer, and other books of practical religion. The other, composed of Christians of all religious denominations, confines its distribution to the Bible alone. It is called the British and Foreign Bible Society, and employs persons to translate the holy books into languages in which they were never seen before, and in conveying them to the countries where they are gratuitously dispersed. Its distribution in this country is very considerable. Both these societies have various branches connected with them, some in London, and others more numerous in the different parts of the kingdom, and these branches, like the parent society, collect money and disseminate pious books. There is an old society called the *Society for Promoting Religious Knowledge*, chiefly consisting of Calvinistic dissenters, who distribute their writings amongst the poor. There is likewise a Naval and Military Bible Society, and a Merchant Seamen Bible Society, whose names are significant of their objects. The pious desire to spread the knowledge of Christianity amongst unbelievers in distant countries has given rise to the following missionary societies:—

Society for Propagating the Gospel in foreign parts, which was established in 1701, and receives aid from government.

Society for Conversion of Negro Slaves in the British West India Islands was incorporated in 1794.

Church Missionary Society for Africa and the East in 1800.

Baptist Missionary Society in 1792.

London Missionary Society in 1795.

Wesleyan Methodist Missionary Society in 1802.

Moravian Missions of the United Brethren in 1732.

London Association in aid of Moravian Missions in 1817.

Other missionary societies are framed for the purpose of operating within the United Kingdom, one object of which is attended to by the Society for promoting Christianity amongst the Jews, founded in 1808, whose expenditure has been very liberal, and another called the Philo-Judæan, established in 1826.

Besides these, there are societies for promoting missions at home, and in the neighbouring European countries. They are the Continental Society, the Christian Union Society, the Irish Evangelical Society, the Hibernian Society, the Baptist Irish Society, the London Itinerant Society, the Village Itinerary Society, British and Foreign Seamen's Society, Port of London Society for promoting Religion among Seamen, Port of London and Bethel Union Society, and Episcopal Floating Church Society.

According to the best accounts which can be obtained, the whole sum annually collected in London for this class of benevolent designs amounts to nearly L.350,000. Much of the money is raised, and many subscriptions procured, by public meetings, at which exciting speeches are made, describing the success of their operations, and pressing on the auditors the necessity or piety of assisting these institutions. Meetings of this description have become so numerous, that a large public building has been erected for holding them, called Exeter Hall, in the Strand. It is a fine structure, and the interior is very appropriate for the intended purpose.

London is the source from which the law of England is dispensed over the whole kingdom, and in it originate all the important legal proceedings. On this subject, the Inns of Court, in which legal knowledge is imbibed, and in which the initiation of the most respectable branch of practitioners is performed, deserve the first notice. There are four of these inns, which have the power to call to the bar such students of their society as have passed the due preparatory period, which occupies five years for all who have not graduated at the universities, and three years for those who have proceeded to the degree of Master of Arts. No examination takes place at their admission. These societies are of a nondescript nature, not being corporations in the legal sense, but yet possessing considerable wealth, and exercising great power, with little or no actual controul, by means of a body called the Benchers, which is chosen by rules of their own.

The *Temple* is situated partly within and partly without the city. It receives its name from the religious military order of the Knights Templars. They were originally crusaders, who, happening to be quartered in places adjacent to the holy temple of Jerusalem, in 1118, consecrated themselves to the service of religion by deeds of arms. Hugo de Paganis and Geoffrey of St Omers established the order, by binding themselves to chastity and obedience, and professing to protect the pilgrims to the Holy Land from all wrong and robbery on the road. By their devotion, and the fame of their gallant actions, they became very popular in every part of Europe, and were so enriched by the favour of princes and other great men, that, at the time of their dissolution, they were found to be possessed of sixteen thousand rich manors. Their riches seem to have been their chief crime, though their wealth enabled them to indulge in excessive luxury. Crimes were imputed to them, and they were condemned without proof. They founded the Temple in London in the year 1185, and continued in possession of it till their suppression in 1310. When they were condemned to penance and dispersion, Edward II. granted their house to Thomas Earl of Lancaster, and on his rebellion to Aymer de Valance, Earl of Pembroke, on whose death it reverted to the crown. It was then given to the Knights of St John of Jerusalem, for their gallant defence of the Island of Rhodes against the Turks. These knights, in the reign of Edward III., granted the Temple to the students of the common law, to whose use it has ever since been applied.

The church of the Temple is an object of great curiosity. It was erected in 1185, on the model of the church of the holy sepulchre at Jerusalem. The entrance is through a door with a Saxon arch. The form is circular; it is supported by six round arches, each resting on four round pillars, bound together by a fascia. It has undergone a thorough reparation since 1828, and has been recased with stone. It contains many monuments of eminent men connected with the establishment during its existence; amongst others, of the eminent lawyers Plowden, Selden, and Vaughan. A division of the establishment was made into the Inner and Middle Temple, which now form two distinct bodies, having their members, revenues, and regulations separate, but enjoying the church in common. Each of these bodies admits or calls students to the bar; each provides for them tables of three grades for the benchers; the barristers and the students are provided, during term time, at very moderate rates. The whole of the buildings are divided into separate suites of apartments, in which men of all degrees of expenditure find accommodation. The garden of the Temple, formed by embankment on the side of the river, is a pleasant promenade, which has been rendered celebrated by Shakspeare, who makes it the place where the badge of the white and red rose originated, under which the respective partizans of the houses of York and Lancaster were arranged. The chaplainship of the Temple is a valuable and honourable office, and has been filled by some of the greatest divines of the English church. The chaplain is denominated the Master.

Lincoln's Inn is an old building in Chancery Lane, partly in the liberty of the Rolls, and partly in Westminster. It was originally a Dominican monastery, but, on the monks removing to Blackfriars, the ground was granted to Henry Lacy, Earl of Lincoln, who built upon it an inn, or residence for himself, where he died in the year 1312. From this the present name has been derived. In the reign of Henry VIII., one of the Bishops of Chester granted leases of the buildings to certain students of the law, reserving a lodging for themselves when they came to London. It has a chapel built on massive pillars, with a dry walk under it. The hall is used as a court out of term. The power of calling to the bar, the service of the tables, and other matters, are nearly regulated in the same manner as in the two Temples. The new square and stone buildings contain many good apartments; and there have been other modern erections.

Gray's Inn, the last of the four establishments from which barristers emanate, is in Holborn. It was the residence of the Lord Greys in 1315, and was sold by one of them to Hugh Denys, and then came to the Prior of Sheene, who disposed of it to the students of law. It has its hall adorned with a curiously carved oak-screen, with portraits of the three kings of the house of Stuart. The chapel is not remarkable; but it has a good and spacious garden, in which new buildings have recently been erected. The regulations for admitting barristers, for the service of the table, and for other matters, differ but little from those of the Temple and Lincoln's Inn; but the number of professional men, especially of barristers, is much larger in proportion to the establishment, than in the other Inns of Court.

There are other piles of building in the same vicinity, still called inns, which were such probably in former times, and occupied as preparatory schools of law, or by the attorneys and attendants on the courts. These are, Clement's Inn, with a hall, in which there is a portrait of Judge Hale, and those of some others, and, in the square, a fine statue of a negro, holding in his hand a sun-dial. Thaves's Inn, in Holborn, has been purchased by the society of Lincoln's Inn, and is occupied by private persons. Clifford's Inn, in Fleet Street, is small and old. Staples Inn, in Holborn, is said to have been formerly the wool-market; in its hall are casts of the twelve Roman Emperors, and some portraits. Lyon's Inn, in Newcastle Street, was originally an inn with that sign; it is small. Furnival's Inn, in Holborn, belonged to a noble family of that name, now extinct; it has been lately rebuilt, in a style which makes it an ornament to the street. Barnard's Inn is also in Holborn, but has nothing to render it remarkable. Symond's Inn, in Chancery Lane, was formerly used by the Masters in Chancery, before their removal to the public office in Southampton Buildings. New Inn, in Wych Street, is small, and in some way connected with the Middle Temple. There are in all of these separate apartments, reached by common staircases, into which they open. They are let indiscriminately to any tenants, but are chiefly occupied by persons of the different branches of the legal profession. There are two others, called Sergeant's Inn, one in Chancery Lane, mostly occupied by sergeants-at-law; the other in Fleet Street, with private dwellings, except that the Amicable Insurance Company have their office in it.

Courts of Law.

The Courts of Law established in the metropolis are, in number and jurisdiction, conformable to the requisitions that are made on them by the nature and division of the law, and by the business transacted in them. The chief courts are in Westminster Hall. On entering the great or eastern door, the first on the right hand is the King's Bench; the Common-Pleas Court, the Exchequer, the Bail Court, the Vice-Chancellor's and the Chancellor's follow in succession; and above stairs is the Court of the Master of the Rolls. In a building, once a part of the Exchequer, adjoining, and which, according to tradition, was the Star Chamber, is a court for the new Judges of Bankruptcy.

During term time these courts are occupied by the respective judges. They are neatly and appropriately fitted up, and tolerably commodious. In the intervals between the terms, the Lord Chancellor, the Vice Chancellor, and the Master of the Rolls, sit at Lincoln's Inn; the Chief Baron of the Exchequer in Gray's Inn; and the Chief Justice of the King's Bench and of the Common Pleas try jury causes at the Guildhall of the city, where appropriate courts are prepared to receive them.

There are two civil-law courts in Doctors Commons. The first is the ecclesiastical court, which takes cognizance of blasphemy, heresy, divorces, adultery, fornication, simony, incest, and some other crimes; and also regulates the induction to church preferments, the rights of pews, churches, and burial-grounds, the probates of wills, and the granting administration in cases of intestacy. It is the depositary of all wills in the province of Canterbury; and they are so carefully preserved and registered, that reference can be made to any will in a few minutes, and the examiner, for the small fee of a shilling, may read any one in the place. The other court, called the Court of Admiralty, is empowered to decide on all cases of capture of ships, to judge of crimes committed on the high seas, and to determine disputes between sailors and their captains in merchant ships. The Court of Arches is also held at the same place, and is a court of appeal from the ecclesiastical court. There are two classes of practitioners in these courts, the proctors and the advocates. The former must be admitted by a fiat from the archbishop, before the judges will admit them to practise. The advocates are only such as have taken the degree of doctor of laws in one of the universities. The whole building is somewhat in the style of a college, inclosed with gates, and contains, besides the courts, apartments for the judges and officers, and chambers for the advocates.

There are some other inferior courts, such as that of the Lord Mayor, of the Sheriffs, several for the recovery of very small debts, called Courts of Request, and the Marshalsea, or Palace Court. To these may be added the Insolvent Debtors' Court, which has much more practice than any of them, being presided over by regular and well-instructed Judges, whose jurisdiction extends over the whole kingdom. Upon fairly giving up the whole of his effects, and rendering a true account of his debts, the prisoner is by this court released from confinement.

The principal criminal court is that of the Sessions-house in the Old Bailey, the jurisdiction of which was extended, by a law in 1834, to many parts of Surrey, Kent, and Essex, where it did not reach before. It is nominally presided over by the Lord Mayor and aldermen; but the prisoners are tried by the regular judges, a few by the Recorder, and some by the Common Sergeant. Inferior offences are tried before the justices of the peace for the county of Middlesex, at the Sessions-house at Clerkenwell. Misdemeanors are also tried at Horsemonger Lane, by the justices of Surrey, and at Guildhall by the city authorities. The Lord Mayor sits at the Mansion-house, and an alderman at Guildhall, to judge in smaller matters, and to inflict punishment correspondent to their guilt on offenders. There are eight offices of stipendiary magistrates beyond the limits of the city, who, like the Lord Mayor and aldermen, have the power to punish, by fine and imprisonment, for disorderly conduct, and for various other offences specified in various acts of parliament. These magistrates, like those of the city, examine into crimes of the highest nature, and, on the charge being made probable, commit them to prison, to be tried at the gaol delivery. At each of these offices three magistrates attend, and they have from eight to twelve constables attached to them, called police-officers, who, besides their pay, make profits from the services of summonses, warrants, searching for offenders, and portions of penalties.

Prisons.

The prisons in London are appropriated to various purposes, and under different authorities. The first to be noticed is *Newgate*, which is under the jurisdiction of the Lord Mayor, aldermen, and sheriffs, and is the common gaol for London and Middlesex. It was burned by the mob in the riots of 1780, but speedily rebuilt, as at that time there was little wood in it. It is divided for three classes of culprits; one part for convicts, another for those to be tried and such as have been committed for misdemeanors, and the third divided into two parts, for tried and untried females. The number of prisoners varies from 350 up to 900. There is a chapel within the walls, in which divine service is performed twice every Sunday, and once on three other days of every week. The largest of the prisons is the Middlesex house of correction in Coldbath Fields, which commonly contains about 1200 persons, who are employed in picking oakum. A tread-mill is in operation; and of late silence amongst the prisoners has been enforced, which seems to have produced a very beneficial effect.

Giltspur Street Prison is near to Newgate. It is a pile of considerable extent, of rustic stone work, but has only apartments for about 200 prisoners. These are such as are under examination previous to commitment, besides vagrants or disorderly persons taken up at night. It is sometimes used as a house of correction, and the persons sent to it are employed in various kinds of work.

Clerkenwell Prison is near the house of correction in Spa Fields, and is a common gaol for the county of Middlesex. It receives prisoners of all descriptions, and is capable of containing about 300 persons.

Fleet Prison, in Farringdon Street, is chiefly used for the confinement of debtors, or for such as are committed by the Court of Chancery or of the Common Pleas for contempt. The average number of persons confined in it is about 250; but there are about 60 others within the rules or limits, which extend both up Ludgate Hill and Fleet Street.

The *King's Bench Prison*, in Southwark, is large, and, by the improvement of the law, has of late been but thinly occupied. It is principally a place of confinement for debtors, or of such as are sentenced to it for libels or other misdemeanors. It contains 220 rooms, and is surrounded with a lofty brick wall. Debtors are allowed to purchase what is called the liberties, that is, to have lodgings without the walls, but within the rules, which extend over the whole of St George's Fields, and into parts of Southwark.

Horsemonger Lane Prison, in Southwark, is the gaol for the county of Surrey. It is a large building, erected in 1781, and surrounded with a lofty wall, and it is occupied both by felons and debtors. On the top of it is the place of execution for criminals sentenced to death. The number confined varies from 200 to 300.

The *Borough Compter*, though under the jurisdiction of the Corporation of London, is restricted to some of the parishes in Southwark. The experiment is here tried of separating and classifying the prisoners, who are employed in various kinds of labour.

New Bridewell Prison is in St George's Fields, and a substitute for the City Bridewell. It is devoted to the correction and education of the idle and disorderly, who are chiefly employed on a tread-mill, by which the corn is ground for the support of the patients in Bethlehem Hospital.

The *New Debtor's Prison* in White Cross Street, is used only for such debtors as were formerly confined in Newgate amongst felons. It is capable of containing 400 persons.

The *Penitentiary* at Millbank has been a most expensive experiment on the Panopticon principle. It is intended to reform the convicts, who are kept regularly at work in various manufactures; and attention is paid to their moral and religious instruction. The females are under the management of officers of their own sex. The prisoners receive a part of their earnings, and the remainder is given to them on their being discharged. It is capable of receiving 400 male, and the same number of female prisoners.

A Statement of the Number of Persons charged with Criminal Offences who were committed to the several Gaols in London and Middlesex for Trial during the 21 *years from* 1813 *to* 1833, *both inclusive.*

Years.	Number of Persons.		
	Males.	Females.	Total.
1813 . . .	1229	478	1707
1814 . . .	1216	430	1646
1815 . . .	1514	491	2005
1816 . . .	1729	497	2226
1817 . . .	2157	529	2686
1818 . . .	2108	557	2665
1819 . . .	2193	498	2691
1820 . . .	2274	499	2773
1821 . . .	1998	482	2480
1822 . . .	2003	536	2539
1823 . . .	1955	548	2503
1824 . . .	2042	579	2621
1825 . . .	2228	674	2902
1826 . . .	2734	723	3457
1827 . . .	2719	662	3381
1828 . . .	2767	749	3516
1829 . . .	2763	804	3567
1830 . . .	2560	830	3390
1831 . . .	2753	761	3514
1832 . . .	2873	866	3739
1833 . . .	2829	863	3692
1834 . . .	2699	848	3547

A Statement of the Number of Persons charged with Criminal Offences, who were committed for Trial, and convicted, sentenced, acquitted, &c., in London and in Middlesex, in each of the three last Seven Years.

		In the seven years ending in 1819.	In the seven years ending in 1826.	In the seven years ending in 1833.
Committed for trial.	Males, ...	13,146	15,234	19,264
	Females, ...	3,480	4,041	5,535
	Total, . .	15,626	19,275	24,799
Convicted and sentenced to	*Death, ...	1,254	1,145	1,043
	Transportation for life, .	466	707	771
	...... for 21 years,	...	...	1
	...... for 14 ...	390	496	1,123
	...... for 7 ...	2,659	3,036	4,989
Imprisoned, and severally to be whipped, fined, pilloried, and kept to hard labour, ...	5 years, ...	2	...	...
	3 years, ...	8	3	6
	2 years, and above 1 year,	146	118	161
	1 year, and above 6 months,	880	772	616
	6 months, and under, . .	3,027	4,694	6,975
Whipping, ...		228	385	424
Fined, ...		618	746	724
	Total convicted, . .	9,678	12,102	16,833
	... acquitted, . .	3,395	4,549	5,151
No bills found, and not prosecuted, ...		2,553	2,624	2,815
	Total, . .	15,626	19,275	24,799
* Of whom were executed, ...		* 138	* 162	* 81

A Summary of the Crimes for which Convictions were obtained in London and Middlesex, in each of the years from 1827 *to* 1833.

	1827.	1828.	1829.	1830.	1831.	1832.	1833.
Arson, and other wilful burning,	...		1	...	...	...	...
Bigamy,	2	17	6	3	10	6	7
Burglary,	33	14	7	4	6	3	3
Breaking a house or shop, with larceny,	28	64	47	65	73	74	81
Cattle-stealing, or feloniously killing cattle,	3	3	2	1	2	4	2
Child-stealing,	...	...	1	2	4	...	...
Coining,	6	3	...	...	7	1	...
Coin, counterfeit, uttering and having,	46	42	79	67	81	99	107
Embezzlement by servants,	47	48	33	37	33	37	48
Forgery of, and uttering forged instruments,	5	8	11	6	4	25	27
Forgery of, and uttering Bank of England notes,	..	2	1	...	...	2	5
Fraudulent offences,	47	45	58	50	60	56	37
Game laws, offences against,	...	2	...	3	1	...	...
Horse-stealing,	16	12	3	4	9	13	3
Larceny,	1502	1524	1594	1507	1574	1725	1760
Larceny in a dwelling-house,	68	26	30	44	42	39	47
Larceny from the person,	340	325	321	325	376	446	410
Letters containing bank-notes, &c. secreting or stealing,	2	...	...	...	...	1	2
Letters, sending threatening,	...	1	1	1	1	1	1
Manslaughter,	14	9	5	4	6	9	4
Murder,	1	1	1	1	3	6	2
Murder, shooting at, stabbing, and administering poison, with intent to,	1	5	1	4	6	9	5
Murder, attempt to strangle an infant,	...	...	1	...	...	...	...
Murder, concealing the birth of an infant,	...	...	4	4	...	1	2
Perjury,	4	2	...	2	2	3	1
Piracy,	...	...	...	4	...	...	...
Rape,	1	...	2	...	...	...	...
Rape, assault with intent to commit,	11	9	9	9	11	7	9
Robbery of the person on the highway and other places,	39	23	18	9	10	18	15
Sheep-stealing, and killing with intent to steal,	5	2	5	...	3	3	4
Sodomy,	...	2	...	...	...	1	...
Sodomy, assault with intent to commit, and other unnatural offences,	9	14	6	19	2	14	23
Stolen goods, receiving,	34	22	24	32	28	38	44
Transports being at large,	5	2	3	2	...	1	2
Felony, assembling armed to assist smugglers, &c.	...	11	...	...	...	...	...
Felony, trafficking in slaves,	...	...	...	3	...	...	...
Felony and misdemeanor not otherwise described,	31	39	44	16	18	11	38
Total,	2300	2277	2328	2227	2372	2653	2686

Statement of the Number of Persons sentenced to Death, with their Crimes, and the Number that were executed in London and Middlesex in the Years from 1827 *to* 1833.

Crimes.	1827.		1828.		1829.		1830.		1831.		1832.		1833.	
	Con.	Ex.	Con.	Ex.	Con.	Ex.	Con.	Ex.	Con.	Ex.	Con.	Ex.	Con.	Ex.
Arson,	...	...	...	...	1	1	...	...	...	...	...	...	...	...
Burglary,	33	2	14	1	7	2	4	...	6	...	3	...	3	...
Breaking into a dwelling-house,	28	...	59	8	40	6	47	2	68	...	54	1	78	1
Cattle-stealing,	3	...	3	..	2	...	1	...	1	...	2	...	...	...
Coining,	6	2	3	2	...	...	...	...	7	...	...	...	...	...
Coin, counterfeit, uttering,	1	...	2	...	5	...	2	...	3	...	1	...	...	...
Forgery of instruments, and uttering,	5	...	8	1	11	5	5	...	4	...	7	...	...	...
Forgery of bank-notes, and uttering,	...	...	2	1	1	1	...	...	...	...	...	...	...	...
Horse-stealing,	16	3	12	1	3	...	4	...	9	...	3	...	...	...
Larceny in a dwelling-house,	68	3	26	1	30	1	44	...	42	1	13	...	...	.
Letters, stealing and secreting, with bank notes,	2	1	...	...	...	...	...	...	...	...	1	1	2	...
Murder,	1	1	1	1	1	1	1	1	3	2	6	3	2	1
Carry forward,	163	12	130	16	101	17	108	3	143	3	90	5	85	2

Crimes.	1827.		1828.		1829.		1830.		1831.		1832.		1833.	
	Con.	Ex.	Con.	Ex.	Con.	Ex.	Con.	Ex.	Con.	Ex.	Con.	Ex.	Con.	Ex.
Brought forward,	163	12	130	16	101	17	108	3	143	3	90	5	85	2
Shooting at, or stabbing, or administering poison with intent to murder,	1	...	5	2	1	1	4	...	6	...	9	...	5	..
Attempting to strangle an infant,	...	...	...	...	1	1	...	...	...	...	...	...	...	...
Piracy,	...	...	...	...	...	...	4	2	...	...	...	...	...	...
Rape,	1	...	...	...	2	...	...	...	...	...	...	...	...	...
Robbing on the highway,	39	4	23	3	18	5	9	1	10	...	18	1	15	...
Sheep-stealing, and killing with intent to steal,	5	1	2	...	5	1	3	...	3	1	1	...	...	...
Sodomy,	...	...	2	...	...	...	...	...	...	...	1	...	...	...
Transports being at large,	5	...	2	...	3	..	2	...	..	...	1	..	2	..
Felonies, assembling to protect smugglers, trafficking in slaves, and transferring a stamp to defraud,	...	...	11	...	...	...	3	...	1	..	..	...	...	...
Total,	214	17	175	21	131	25	133	6	163	4	120	6	107	2

tific Lite- nsti- ns.

The institutions of the metropolis for the purposes of the professional education of legal and medical men having been already noticed, it seems proper to advert to those establishments which are designed to promote and diffuse knowledge in general, whether scientific, historical, or classical.

The first of these is the *Royal Society*, founded in the reign of Charles II., now holding its meetings in apartments provided by the crown for that purpose in Somerset House. Its labours and its merits are so well known, that any description or encomium here would be superfluous. It consists of a president and a council, composed, with the vice-presidents, of twenty members, and a numerous body of fellows chosen by ballot. It has a secretary, an assistant secretary, and librarian, and holds weekly meetings on Thursday evening, and one annual meeting on the 30th of November, when the council and officers are chosen.

The *Royal Society of Antiquaries* was founded in 1751, and is also provided with apartments by the public in Somerset House. It is managed by a council of twenty-two members, chosen annually on the 23d of April, and has weekly meetings on the Thursday evenings. Its researches into the antiquities of this kingdom, and of other countries, ave been diligent, and have thrown great light upon many istorical subjects and events.

The *Royal Society of Literature* is of recent origin, aving been founded in 1825. It has published two vo- umes of its proceedings, of great curiosity, and has contributed to the inquiry respecting the Egyptian hieroglyphics, by printing several fasciculi of such of them as seem in the best preservation. It has a president, ten vice-pre- dents, and a council, annually chosen of fifteen members, including the English and foreign secretary, and the trea- urer. Its weekly meetings are on the Thursday morning, at the house which it has built in St Martin's Place, Charing ross.

The *Royal Institution* in Albemarle Street, was founded in 1800, chiefly by the exertions of Count Rumford. It has a good chemical apparatus, which was long employed in the best manner by the late Sir Humphry Davy, and, after his connection with it ceased, lectures continued to be delivered, both on subjects of science and taste, which have had much influence on the promotion of knowledge. It has a tolerable library, and the current periodical literature is collected for the use of members. The lectures are announced in the journals.

The *London Institution*, in Finsbury Circus, is an establishment of the same kind as that in Albemarle Street. It is a handsome erection, and has a most valuable library, well arranged, and lectures are delivered on scientific subjects.

The *Linnæan Society* was founded in 1802, in Soho Square, it holds its meetings on alternate Thursdays, in the evening, and has been successful in extending the knowledge of botany, both as regards foreign and British plants.

The *Horticultural Society*, whose objects are pointed out by its name, was founded in 1808, and has a suite of apartments in Regent Street, where, on alternate Tuesdays, in the season, displays are made of improved specimens of fruits, flowers, and other products of the garden.

The *Zoological Society* was first established in 1829, and in the few years that have passed, has met with unexampled success and approbation. Its house is in Bruton Street, where a large collection of stuffed animals may be seen; but the most attractive part of this institution is its garden in the Regent's Park, to be hereafter noticed.

The *Royal Asiatic Society* was founded in the year 1820, in Grafton Street, and holds its weekly meetings on Saturday, and is occupied with researches into eastern literature.

These societies are here separately classed, because they are chartered bodies; but there are others without charters which are not less useful or respectable, and equally deserving of notice.

The *Society for the Encouragement of Arts, Manufactures, and Commerce*, was first established in the year 1754, and has beneficially applied itself to the purpose which its name announces. It meets in John Street, Adelphi, but has annual exhibitions, in some larger buildings, of improved mechanism, and of other inventions, and of specimens in the fine arts, where prizes of an appropriate nature are distributed to successful competitors.

The *Russell Institution*, in Great Coram Street; the Western Literary and Scientific Institution in Leicester Square; the city of London Literary and Scientific Institution in Aldersgate Street; the Metropolitan Literary Institution in Chatham Place; the Surrey Institution, in Union Row, Camberwell; the Southwark Literary and Scientific Institution, in Trinity Place, Blackman Street; and the Belgrave Institution, in Sloane Street, have all been established within the last fifteen years. Their objects are the same as those of the Royal and the London Institution, and, as far as their several degrees of pecuniary power extend, they are of use in promoting the spread of knowledge.

The *Society*, properly described by its name as having for its object *the Diffusion of Useful Knowledge*, now forms a prominent part of the means of general instruction. It was first established in 1827, in South Square, Gray's Inn, and its progress has been excessively rapid. Its attention is chiefly directed to publishing, in a form so economical, as to bring them within the reach of a vast number of persons, a great variety of works of such a nature, as must tend to improve the minds of those who are anxious to acquire knowledge. By using good but not high priced paper, by stereotyping, and by printing large editions, they are enabled to furnish their books at very low rates. Their Almanac, their Penny Magazine, their Penny Cyclopædia, and numerous other works, are all well and faithfully executed, and every degree of scrutiny is applied to prevent in them the insertion of whatever may tend to weaken the moral or religious principles of the readers.

Some other societies have been formed on the same, or nearly the same plan; but, though equally commendable in their design and execution, they have not been attended with equal success.

The *Geological Society*, formed in 1826, has been favoured with a suite of apartments by government, in Somerset House, where its valuable collection of fossil and mineral specimens is rapidly increasing. It meets on the first and third Fridays in each month, when communications are made which must tend to increase the knowledge of this branch of science.

The *Astronomical Society*, though not of more than twelve years' existence, has acquired and maintained the highest reputation by its publications. It is composed of the most eminent astronomers of this kingdom, and holds a constant communication with those of other countries. It holds monthly meetings on the second Friday of each month, but its principal labours are performed in the observatories of the several members, of which several have been erected in different parts of the kingdom, chiefly in consequence of the impulse given by the society.

The Fine Arts have also societies established for their promotion, which may be mentioned here. The *Royal Academy of Arts* was established by royal charter in 1768, and has apartments at Somerset House, where they have a good collection of paintings, casts, and statuary, and where, under their direction, an annual exhibition is made of the productions of the pencil and the chisel of British artists.

The *British Institution*, in Pall Mall, is an association of amateurs, who obtain the best pictures from their owners, and produce them annually in an exhibition at their house. It was founded in the year 1805. There is besides the Society of Painters in Water Colours, who annually exhibit the productions of its members and others. The powers of the art, in this branch, are very great, and have rapidly increased since the establishment of this society in the year 1804.

The societies for the cultivation of music are all of recent formation. Those which may be distinguished as public institutions are the Royal Academy of Music in Tenterden Street, founded in 1822; the Royal Harmonic Institution, in Regent Street; the Philharmonic and the Metropolitan Cambrian Institution. This delightful art is taught in both instrumental and vocal branches, by numerous private professors, and is displayed at the numerous private concerts annually given by eminent performers, in the theatres, and the various assemblages where dancing is combined with it.

Colleges and Schools.

Amongst the most prominent institutions for general instruction, the *London University* deserves the first notice. It was commenced by voluntary contributions, begun at a public meeting in July 1825, and commenced some slight operations in the February following, and the first stone of the building was laid on the 30th of April 1827. It was designed upon a plan so extensive, that the pecuniary means to execute it were found insufficient, and the centre only has been finished. It is a beautiful and classical edifice, and, in its present state, is sufficiently ample for the number of students. The whole is well arranged with lecture rooms, apartments for the apparatus of natural philosophy, a spacious library, and an anatomical theatre. It receives pupils in law, in the various branches of medical study, in the general sciences, in classics, and in modern languages. The professors have usually been men eminent in the respective branches they undertake to teach, but the frequent change in them must have been somewhat disadvantageous.

The number of pupils in 1835 was as follows:—In the medical school 394, of whom sixteen attended to veterinary medicine alone, and of the remainder 132 attended the practice of the hospital. The students in the Faculty of Arts were 141, of whom fifteen attended solely to law. Twenty-five of them attended law and other subjects, and seven of them attended political economy. The numbers in the junior school were 375, thus making a total of 901.

King's College was founded somewhat later than the London University. It has been built by voluntary subscriptions, on a vacant piece of ground on the east side of Somerset House, and has been erected so as, in harmony with that building, to form one of the wings of its front towards the river Thames. It was opened on the 8th of October 1831. The college is patronized by the dignitaries of the church and the more zealous of its lay members, and instruction in the Christian religion, according to the forms and faith of the establishment, forms part of the course of education. In the chapel daily religious worship is performed. In these two respects it differs from the London University. The other subjects of education for which it provides are attended to by professors of great merit, and in this respect it differs but little from the rival institution. The college has attached to it a preparatory school, where the first elements of classical literature are well impressed on the pupils, and where the modern languages are taught.

The number of pupils, in the beginning of 1835, was as follows:—

Regular students for the prescribed course, .	133	
Occasional students in various departments of science and literature, ...	104	
		237
Medical department:—		
Students for the whole course, ...	42	
Occasional students in various branches, . .	175	
		217
Junior branch, for the general course of instruction,		461
Total, . .		915

Within the metropolis are several schools for classical literature of the highest kind, besides those of the Charterhouse, and of Christ's Hospital, for a select number of pupils, which have already been noticed. The most celebrated is St Paul's School, founded by Dean Collet, in 1509. It is at the eastern end of St Paul's Churchyard, and has been rebuilt on the same site since the year 1822. It is an elegant building, with a magnificent portico supported by six columns. It was originally destined to educate 150 boys gratis, but has now more than double that number. The masters are excellent. The school consists of eight forms; in the first the rudiments are taught, and the pupils are advanced to the eighth, from which, with a competent portion of Latin, Greek, and Hebrew, they are removed to one of the universities, where they have the benefit of good exhibitions. The Mercers' Company are the trustees of the institution.

Merchant Tailors' School, in Suffolk Lane, Canon Street, was founded by that company in the year 1561. The building was destroyed by the great fire of 1666, and the present house erected on the same spot. It is very spacious, and supported on the east by stone pillars, forming a cloister, within which are apartments for the ushers. Adjoining the school are the library and chapel, and contiguous is a house for the head master.

In the school about 300 boys are educated, of whom 100 are taught gratis, 50 at 2s. 6d. per quarter, and 50 at 5s. Annual examinations are held, and public exercises performed by the scholars, of whom several are sent annually to St John's College, Oxford, which was principally founded for the use of this school, and where there are no less than forty-six fellowships for those educated in it.

Besides these classical schools of ancient foundation, many valuable institutions have been recently formed by a kind of joint-stock proprietors, which afford excellent education. They are in connexion with King's College, and have similar regulations and methods of teaching with that institution. They are built in good taste, and capable of receiving about 300 boys, and of qualifying them for admission to the universities. Already one has been opened at Pimlico, one at Kensington, one at Islington, one at Hackney; and in several other parts of London they are either built or building. Those boys sent by proprietors are taken at a little lower rate than the others, but the highest charge is moderate.

It is impossible to calculate the number of day and of boarding-schools for both sexes in and around the metropolis. They are of all degrees of utility, and of all classes, as regards the expense of them.

Attention to the education of the poor has vastly increased of late years. Half a century ago there were in every part of the city what were called ward-schools, in which a number of both sexes were taught reading and writing, and the catechism, and uniformly clothed; and in each of the out-parishes the same system was followed. These, to the number of eight or nine thousand, were accustomed to attend divine service on a fixed day at St Paul's, where temporary seats under the dome were prepared for them, and they presented a most striking and even delightful exhibition. Of late years other schools upon what is called the national plan have been framed and increased. Infant and day schools have also been established, and instruct great numbers.

By a report of a committee of the House of Commons, made in 1833, the following is the result of the inquiry instituted as regards purely charity schools of all kinds:—

1st, Infant schools, . .	109		
Number of males in them, .		3,065	
... ... females		2,441	
... aged from two to seven years, but the sex not specified, ...		3,226	
			8,732
2d, Daily schools, . . .	2,152		
Number of males, . .		49,991	
... ... females, . .		34,446	
Sex not specified, . .		8,051	
			92,488
3d, Sunday schools, . .	329		
Number of males, . .		23,440	
... ... females, . .		23,225	
Sex not specified, . .		5,456	
			52,121
Schools, .	2590	Pupils	153,341

Schools established by Dissenters,—

	Schools.	Scholars.
Infant schools, . . .	7	577
Daily schools, . . .	103	9,170
Sunday schools, . . .	150	27,689
	260	37,436

The above are returns from the county of Middlesex, including the city and Westminster; and if the inhabitants of the county beyond the limits of the metropolis be taken as equal to those in the Southwark part of the metropolis, the result will be the same.

Places of amusement.

In the amusements of the metropolis the attention is first of all attracted to the theatres. Considering the number of inhabitants and their aggregate wealth, London has fewer of such houses than most of the other capitals of Europe. The most fashionable and splendid is the *Opera House*, where the music and the dancing highly delight the visitors. It was burned down in 1790, and has since been rebuilt at an enormous expense, from a design of Nash. The interior is arranged with a total disregard of cost. It is nearly the largest theatre in Europe. The stage is sixty feet long, and eighty broad, and the distance between the opposite boxes is forty-six feet. Each box is inclosed with curtains, and those who occupy them sit in chairs. These boxes are either private property or hired for the season. The pit and gallery are open to those who chuse to pay the price. The whole is capable of accommodating 2500 spectators, and those who frequent it are either persons of the highest rank or amateurs, or those who are desirous of being thought to belong to one or other of these classes. The prices of admission are high, but do not equal the expense of the establishment, which is involved in debt, and also frequently embroiled with proceedings in the Court of Chancery.

Drury Lane Theatre, in Bridge Street, enjoys, with the theatre in Covent Garden, a kind of monopoly, by patent, as far as regards the mere exhibition of tragedy and comedy. It has been burned down, but was replaced in 1811 by the present large edifice. It is simple, and of the Doric order, having in front a handsome portico, surmounted by a statue of Shakspeare, added in 1820. The grand entrance leads through a spacious hall, supported by five Doric columns, to an elegant rotunda, whence staircases ascend to the boxes. The interior of the house presents about three quarters of a circle from the stage, and has a splendid though not a gaudy appearance. It is illuminated by an elegant gas chandelier, which hangs over the centre of the pit. The stage at the opening of the curtain is 43 feet wide and 38 high. The diameter of the pit is 53 feet, and the height of the house from the pit floor to the ceiling is 50 feet. It is calculated that 3600 persons may be conveniently seated, one-half of which number must be in the boxes. During Lent performances of sacred music are given instead of regular dramas.

Covent Garden Theatre has its principal front in Bow Street, and much of the rest of the building is hid by houses. It was destroyed by fire in 1808, after which the present edifice was erected on an extensive scale. It is nearly of a square form, and the design was taken from the Temple of Diana in the Acropolis of Athens. The front is ornamented with statues representing comedy and tragedy, and *basso-relievos* descriptive of the ancient and modern drama. The interior is elegant, having at the entrance an Ionic staircase, between the columns of which are suspended Grecian lamps. The stage is very spacious, and there are three rows of boxes, an extensive pit, and two galleries, which are calculated to seat 3000 spectators; it is throughout lighted by gas. A superb chandelier over the centre of the pit produces a fine effect. When the house is crowded the admission money received at the doors amounts to about L.900.

From the complicated nature of the property, both these great theatres, like the Opera House, have been the subject of frequent litigation, and heavy charges have on that account been incurred. The Court of Chancery has seldom been free from dramatic suits. The taste for dramatic performances in this country appears of late to have changed much, and owing to the size of the houses, which are too large for the human voice to be distinctly heard, the pieces represented depend more upon splendid exhibitions that strike the eye than upon the elegant language of the authors of dramatic works. The expense of these kinds of exhibitions, and the falling off of spectators, have very much embarrassed the affairs of these great concerns.

Whilst the two great theatres are closed, that in the Haymarket is allowed to be opened. It was once occupied by the celebrated Foote. The present house, on the same site, was rebuilt in 1821, from the designs of Mr Nash. The front is ornamented with a lofty portico, supported by six columns of the Corinthian order, over which are nine circular windows, richly sculptured. It is much smaller than the two regular theatres, but has two ranges of boxes, with a pit and gallery. The prices of admission are lower than at the other houses. Sometimes a company of French actors have performed in it.

Besides these, which may be called the houses of the regular drama, several theatres have been opened which require to be briefly noticed.

The *English Opera House, or Lyceum*, in the Strand, is newly rebuilt, after being destroyed by a fire in 1830. As its name denotes, the pieces represented are in a great measure musical. In the interior, it is 40 feet in diameter, and 37 feet in height, with a handsome saloon 63 feet by 24.

The *Royal Circus*, or *Surrey Theatre*, in Blackfriars Road, was chiefly destined for exhibitions of horsemanship, but has of late produced ballets, melo-dramas, and similar performances.

The *Royal Victoria Theatre*, in Waterloo Bridge Road, built in 1818, is well calculated for dramatic representations, but the performers are not of the highest class. It is sometimes called the Coburg Theatre.

Saddler's Wells, in St John's Street Road, is an old establishment, with the new river sometimes turned into it, by which it is enabled to represent aquatic scenes, such as Naumachia, Fingal's Cave, and others.

At the *Royal Amphitheatre*, or *Astley's*, near Westminster Bridge, are exhibited feats of horsemanship, rope-dancing, and other amusements; it is much frequented by children during the school vacations.

The *Royal Adelphi Theatre* in the Strand, sometimes distinguished as the *Sans Pareil*, is now open for entertainments of the comic kind, in which the powers of Mathews used to be much admired.

The *Olympic Theatre* in Wych Street was used for equestrian performances, but, under the management of Madame Vestris, has become a place for exhibiting vaudevilles and dancing.

The *Royal Fitzroy Theatre* in Tottenham Court Street exhibits performances of farces, burlettas, and pantomimes. It was formerly called the Regency Theatre.

According to some newly-contrived plans, theatres of a still lower description are kept open. These are the Royal Clarence, near Battle Bridge; the Queen's Theatre, Windmill Street, Haymarket; Dibdin's Sans Souci Theatre, London Bridge Theatre, and Ducrow's Olympic Circle in Whitechapel.

In the summer months, the gardens of Vauxhall, on the Surrey side of the new bridge of that name, are an inviting place of amusement. They have been a place of resort for more than a century, and during that whole period have been constantly improving in decoration, as well as advancing in the price paid for admission. These gardens are extensive, and, when lighted, have a beautiful appearance, from the variegated lamps in the several walks, from different portions of light distributed in the walks, and from the numerous embellishments. In the centre is an orchestra, and opposite to it an elegant pavilion for large parties, whilst in other places are boxes of various sizes, suited to large or small parties, in which refreshments are served. Many of these are adorned with paintings. In fine weather the music is performed in the orchestra, but when it is damp the band is assembled in the rotunda, which is a fine apartment, seventy feet in diameter, adorned with some fine historical paintings upon the walls. Parties are formed for dancing in many parts of the premises, and in the few weeks of very warm weather it is a delightful place of recreation. The fire-works are magnificent, and there are many transparencies exhibited. Few objects in London have so striking an effect on foreigners as the sight of these gardens, and hence almost every large city on the continent has in its environs an establishment of a similar kind, all retaining the name which it bears in the country whence the idea was conveyed to them.

Clubs.

In so vast an assemblage of persons as London presents, where the incomes, the tastes, the education, and the manners are so various, it is difficult to describe the several sources of amusement that occupy their spare time. Public exhibitions do not seem so congenial to our habits as to the inhabitants of more southern climates; and other sources of relaxation require to be provided. Amongst the male portion of the higher classes, the club-houses are a refuge from ennui; and they have greatly increased of late years, both in numbers and in elegance of building, decoration, and furniture. At all of them newspapers, periodical publications, and the current new works are provided; dinners, breakfasts, and refreshments are prepared; and in most of them, in moderation, but in others to a disgraceful extent, the practice of play is introduced. In these clubs congenial society is to be found, for though some of them are more open than others, yet many are restricted to particular walks of life. Thus the United Service, the Naval, the Military, the University, and others are composed of one description; but as many members of them are also members of other clubs, such as the Athenæum, the Travellers, the Alfred, the Union, and others, a sufficient variety is found to enable them to keep free from what may be denominated clanship.

As there are already more than twenty-five of these societies, varying in their regulations in the sum paid at admission, and in the annual subscriptions, it would be useless, as well as tiresome, to describe them. The number of members in each club varies very much, a few having but 400, and still fewer 1500. The subscribers to the whole amount at present to about 18,000; but as some subscribe to more than one, and a few to three or four, it may fairly be estimated, that the number of gentlemen, of some consideration and wealth, who find amusement in these elegant houses, cannot be less than 12,000. The sums annually expended in these establishments, when the cost of their erection is included, has been calculated to amount to more than L.160,000 annually.

Coffee-houses.

The coffeehouses, which formerly abounded, and then formed a favourite lounge for many persons, have much decreased with the growth of clubs, which have a less promiscuous society, as none who has not some tolerable pretensions can easily become a member. These meetings form a medium between domestic circles and public assemblies, and are in tolerable harmony with the character and disposition which prevail in what is usually termed good English society.

Bazars.

Another source of amusement has been of late introduced, but rather more appropriate to the ladies than to the gentlemen. These are the bazars, consisting of shops, or rather stalls, for the sale of elegant light fancy articles, either of dress or of domestic ornament, but comprehending a great variety of goods, and, what is of importance, mostly served by respectable females. Some of these display uncommon elegance in their fittings up. The most remarkable of the number are the Soho Bazar, in the square of that name; the Queen's Bazar, in Oxford Street; and the

Pantechnicon, in Belgrave Place, which have been the longest open. These have, however, been vastly excelled by a new one in St James's Street, opened in 1832. It consists of two spacious halls on the ground and first floor, which communicate by a magnificent staircase, decorated with mirrors of a large size. But another in the building, known by the name of the Pantheon in Oxford Street, opened in 1834, is thought to excel the St James's Bazar. The form of the interior, the adjoining garden, and the decorations, give it a peculiar character, and excite great admiration.

To these amusements must be added, the indulgence of agreeable walks in St James's and the Green Parks, whose beauties have been much improved within the last few years, the promenades in Hyde Park or the Regent Park, and the delightful mixture of wood and water to be enjoyed in Kensington Gardens.

In a city of such vast extent as the metropolis, there are many objects worthy of consideration, which cannot well be grouped under any specific class; and though, to a certain extent, it has been attempted in this article, it becomes convenient to take a survey by making a kind of tour of the different parts comprising the whole. In doing this it seems desirable to begin with the city, and proceed round it from the east, to the north and the west, and end with the south or Surrey side.

The *Guildhall* of the city of London, being the termination of King Street, proceeding from Cheapside, is an ancient building of the beginning of the fifteenth century. Before its erection the court-hall of the city was in Aldermanbury, whence it was removed in 1411 to the present edifice. It has a Gothic front, recently put in a good state of repair. The great hall is 153 feet in length, 48 in breadth, and 55 in height, and from its capaciousness, is capable of containing seven or eight thousand persons. At the east end is a raised platform called the hustings, from which, at elections, or other public occasions, the speakers address the audience, but can, with difficulty, make themselves heard by those at the lower end. It is also used as a dining apartment on the festival usually called Lord Mayor's Day, held in November. Over one of the windows are two colossal figures, commonly named Gog and Magog, which are supposed to represent a Saxon and an ancient Briton. This apartment is ornamented by some sculpture, in honour of Lord Chatham, by Bacon; in honour of his son William Pitt, by Bubb; and of Lord Nelson, by Smith. There is also a statue to Alderman Beckford by Moore, with a speech that never was spoken, but written by Horne Tooke. Over the entrance is the orchestra, and opposite to it the passage leading to the chamber in which the Common Council assemble, and other rooms, which are occupied by the judges of the Court of King's Bench, Common Pleas, and Exchequer for the trial of city causes. The Common Council Room is ornamented with some good pictures and busts of Lord Nelson, the Duke of Wellington, and Granville Sharp. The Chamberlain's office is in one part of the building, and there is within it a library, with a good collection of books and papers belonging to the city, and adjoining to it is a museum. Near to it is an apartment for the sitting alderman; and on the side is Blackwall Hall, which is now used as the Court of Bankruptcy.

The *Mansion-House* is the residence of the Lord Mayor of London during his year of office. It is a large stone building, erected upon the site of a market called Stocks, between the year 1739 and 1753. No public building has been the subject of more severe architectural criticism than this. It is, however, in spite of a heavy structure over the pediment, a magnificent pile, and is also seen to great disadvantage by its confined situation; but this evil is now remedied by the removal of some of the houses that hid the view of it, and by the opening of a more spacious way to it direct from the New London Bridge. The front has a wide and lofty portico, composed of six fluted columns of the Corinthian order, with two pilasters on each side. Beneath this portico, a flight of steps on both sides leads to the principal entrance. On the left of the entrance-hall is the justice-room, a kind of court of justice, in which the Lord Mayor sits daily in his magisterial capacity. On the principal floor is a magnificent hall, described as the Egyptian Hall, adjoining to which is an elegant and spacious drawing-room. The Egyptian Hall is used for dinner parties, of a more select kind than is usually collected upon the Lord Mayor's Day at the Guildhall. Easter Monday is the chief festival, when after the dinner a ball is given, in a suitable apartment on the next story above. There are in it good family apartments, and suitable apartments for cooking and for servants.

Merchant Tailors' Hall, belongs to one of the richest of the guilds or companies of the city of London. It stands in Threadneedle Street, on the south side. The hall is one of the largest and best proportioned rooms in the city, and it is chiefly remarkable for the great number of men, the most eminent for rank and talent, who have been members of the company, and whose portraits are here to be seen. This company was founded in the reign of Henry VII., in the year 1480, and is called in the charter the art and mystery of the fraternity of John the Baptist. There have at different times been admitted into it seven kings, one queen, seventeen princes and dukes, two duchesses, one archbishop, thirty-one earls, five countesses, one viscount, twenty-four bishops, sixty-six barons, seven abbots, seven priors, and an innumerable list of esquires. In the present day some of our most illustrious men have been admitted to the fellowship; and the annual festivals are distinguished by the rank, talent, and virtues of those who join in them. The company possesses large estates, the income of which is chiefly devoted to benevolent purposes. They support an hospital for their decayed members, and are the patrons of a school, in which the pupils have been regularly imbued with a degree of classical knowledge. The school is in Suffolk Lane, Cannon Street. It is a fine building, forming a kind of cloister, in which are apartments for the master and three ushers. There are in it about 300 boys, of whom 100 are taught gratis, and 50 at ten shillings a-year. They have valuable exhibitions, and numerous fellowships; at St John's College, Cambridge, numbers are annually elected, according to the proficiency which they discover at the general examination.

Many of the other guilds of the city, of which there are no less than ninety-one, called companies, have halls, a few of them very fine buildings, and most of them sufficiently large; but many of the smaller companies being destitute of such accommodations, hold their meetings in taverns.

The goldsmiths existed as early as the year 1180, and were long the chief bankers of the metropolis. They have now the assaying of all articles made of gold and silver. Their hall has been recently rebuilt upon the site of the former, in Foster Lane. It is an edifice of noble proportions, the centre of which is composed of six Corinthian columns, supporting an entablature surmounted by a rich cornice. The five centre windows have balconies, and over them are the sculptured arms of the company. The furniture and decorations of this new building excite the highest admiration.

The hall of the drapers, in Throgmorton Street, is a large square building, on the site of the residence of Cromwell Earl of Essex. It has handsome apartments, a good garden, and is adorned with a fine portrait of Lord Nelson, by Beechey, and some others. This company has some large estates in Ireland.

Stationers' Hall is a large but plain building, in a court out of Ludgate Hill, formerly inhabited by a succession of noblemen of the first rank, from the reign of Edward II. to that of Elizabeth, when an Earl of Abergavenny sold it to the company, which then, as now, was a rich trading body. It was destroyed by the fire of 1666, when the loss in books and other property was estimated at L.200,000. It had long the monopoly of publishing almanacs, and though it has lost the exclusive privilege, continues to print large editions under the name of Francis Moore, by which and other operations, the members are enabled to divide some profit amongst themselves.

Mercers' Hall, in Cheapside, was originally the hospital of St Thomas, having been the birth-place of the venerated Saint Thomas-a-Becket. The present building was erected after the great fire. The front is adorned with figures of Faith, Hope, and Charity, and it contains some very fine apartments. It is a rich corporation, with considerable patronage; and in the list of its members more than sixty have been Lord Mayors, amongst the rest Whittington, Sir Richard Gresham, and Sir Thomas Gresham.

The *Fishmongers* are a rich company, having some large estates in the north of Ireland. Their hall being removed for the purpose of constructing New London Bridge, a new and elegant one has been erected at the foot of that fine pile. It is executed with much taste from the design of Mr Roberts, presenting an imposing front towards the river, and another towards the street. It has a granite basement and the superstructure is of Portland stone.

Grocers' Hall is a handsome building, but hidden, from standing in a small court. It has a spacious public apartment, in which are portraits of Lord Chatham, and of his son William Pitt, who were members of the company. Other halls deserve mention and inspection, but our limits forbid even a short description of them. The best are, Ironmongers' Hall, in Fenchurch Street; Barbers' Hall, in Monkwell Street; Salters' Hall, in a court of Cannon Street; Skinners' Hall, on Dowgate Hill; Saddlers' Hall, in Cheapside; Coachmakers' Hall, in Noble Street; Vintners' Hall, in Thames Street; and Painters' Hall, in Trinity Lane.

That elegant Doric column called the *Monument*, on Fish Street Hill, is a splendid specimen of the taste and genius of its architect Sir Christopher Wren. It was constructed to commemorate the great fire of London in 1666, which destroyed the chief part of the city, and broke out in Pudding Lane, near to the pillar. It is a fluted column, rising from the ground to the height of 202 feet. It stands on a square pedestal of 40 feet, and the diameter of the shaft is 15 feet. There is a winding marble staircase within it, which gives access to a gallery with an iron balcony, from which is a fine view of the city and the suburbs. The top of the column terminates in a large blazing urn of brass gilded. This work was commenced in 1671, and finished in seven years, at the expense of L.14,500. It is built wholly of Portland stone, of which it is said 28,500 feet were employed. On the northern face of the pedestal is an inscription in Latin, narrating the circumstances of the fire, and stating, that the destruction occasioned by it was 89 churches, the guildhall, city-gates, many public structures, hospitals, schools, libraries, a great number of stately edifices, and 13,200 dwelling-houses, and that the surface thereby covered with ruins and ashes amounted to 436 acres. The inscription on the northern side is designed to commemorate the merits of King Charles II., in assisting to repair the evil created by the fire, and to raise the city again to more than its former splendour. It states that a tax on coals was imposed to pay the expenses, and that, in three years, that was finished which was supposed to require an age. On the eastern side the inscription merely recites the date of the commencement of the column, its progress, and the date of its completion. The western front has an emblematic carving of the tragical scenes which occurred at the fire, which was ably executed by Cibber, the father of the poet and player of that name. The whole building has been repaired of late years; and the inscription on the base, which Pope described as a lie, attributing the fire to the Roman Catholics, was very properly removed in the year 1830.

Sion College, in London Wall, was originally a nunnery attached to the church of St Aphage, Cripplegate; but its resources having failed, it was at length granted to the master of the Jewel Office, who held it till it was destroyed by the great fire; but a fund for its support having been established by Dr White, in 1623, it was again rebuilt, and a society incorporated, having the supervision of the almshouse, in which ten men and as many women are provided for. In a spacious hall, in which meetings of the London clergy are held, is a large and valuable collection of books, to which access is given with great readiness. The institution has been enriched by donations at various times. The library contains many portraits of eminent divines who have been members of the college, amongst whom are those of Archbishops Secker and Tennison, and Bishops Gibson, Compton, Terrick, and Sherlock. A benevolent society has been formed here for the relief of indigent widows and families of the clergy of London and its vicinity.

In proceeding upon a tour from the city, we shall take the course which has been pointed out by the law, in constituting the new boroughs around the metropolis, and thus arrive at the Tower Hamlets. In this part, the most prominent objects have already been noticed, being the Docks, the Mint, and the Trinity House. The dwellings in this borough are mostly occupied by the inferior classes of tradesmen, or by handicraftsmen, or by day-labourers; but there is one object, the Tower of London, whose historical relations entitle it to a fuller notice.

Tower.

Tower of London. The origin of this building is lost in obscurity. It is known, by an examination of boundaries, which took place after the murder of Sir Thomas Overbury, that the walls were built on an ancient foundation, but at what period no evidence could be obtained. The great square tower, called the White Tower, foolishly attributed to Julius Cæsar, was certainly built in 1078, under the direction of a great military architect, Gundulph, bishop of Rochester. Fitzstephen gives it the name of *Arx Palatina*, or the Palatine Tower, and states, most romantically, that the mortar of the foundation was tempered with the blood of beasts. The commander had the title of Palatine bestowed upon him, as was the custom in that age. Within this tower is a very ancient chapel, said by Stowe to be coeval with the building, having a long and dark flight of steps ascending to it. It was used for the devotions of the kings and queens who were residents in the building. In the year 1092, a violent tempest caused much injury to the Tower, which was, however, repaired by William Rufus, and by his successor. The first of those monarchs added another castellated building on the south side, between it and the Thames, which was afterwards called St Thomas's Tower, beneath which was Traitors' Gate, through which state prisoners were led from the river, over which was another gate, with a portcullis, called the Bloody Gate, as few that entered ever left it alive, in the early times of our history, when the name was given to it. The Tower was first encompassed with walls by Longchamp, bishop of Ely, who was chancellor of England in the reign of Richard I. He also constructed the ditch, to which water was introduced from the Thames. Different princes afterwards added other works, and thus, in process of time, enclosed a little more than twelve acres of ground, the circuit on the outside of the ditch of which is 1052 feet.

Finsbury.

The borough of Finsbury, which follows next to that of the Tower Hamlets, is very extensive, and filled with inhabitants of a higher class in general; though in some parts re to be found the worst population of the metropolis. Finsbury Square is a handsome quadrangular range of buildings, surrounding a spacious garden. The houses are lofty, nd well built in the modern style, having been gradually rected for the most part about forty-five years. Near to t is a spacious piece of ground, belonging to a voluntary military society, called the London Artillery Company. There is a good house within the enclosure, where the arms re deposited. In ancient times it was used for archers o practise in shooting arrows against butts. From this place Lunardi sent up the first balloon which had been exhibited in London, in 1783. Near this is the chief cemetery of the Protestant dissenters, known by the name of Bunhill Fields. It was first intended for the burial, at the time of the plague in 1665, of those for whom room could not be made in the churchyards, but afterwards was taken by a Dr Tindal, by whom it was converted to the present purpose. The remains of the most eminent men amongst he dissenting clergy repose in this crowded ground. Of hese, the most remarkable are Neale, the historian; Watts, he poet and divine; Lardner, the author of the Credibility; Dr Guise; Dr Price; Dr Kippis; and Dr Rees. It is attended by a clergyman of the established church, who performs divine service; or the devotional forms of any of the sects may be used by their own ministers. Near to this cemetery are the two chapels of the respective sects of the Methodists, which may be considered as their mother churches. The one, belonging to the Wesleyans, is called the Foundery; the other, belonging to the followers of Whitfield, is called the Tabernacle. They have both respectable and numerous auditors, and the preachers are constantly changed, o as to gratify the taste for variety, which is said to be prevalent among both divisions of that religious sect. In he parish of Clerkenwell, within this borough, is the prison already noticed, for the county of Middlesex; and not ar from it is Hicks's Hall, the court of justice where criminals for light offences are tried. The old hall having become ruinous, was taken down, and the present building erected in 1780. It is of stone, with a rustic basement, over which are four Ionic pillars, and two pilasters, supporting an architrave, frize, and cornice, with a pediment. The interior is divided into the court, the room for magistrates, for the grand jury, and the hall. In one of the rooms s a portrait of the builder of the old hall, Sir Benjamin Hicks. Within the borough of Finsbury are included several objects which have been already taken notice of, such s Luke's Hospital, several churches, and most of the inns f Court, as its limits extend up Holborn, so as to inclose he liberty of the rolls, within which some of them are situated.

The borough of Marylebone next comes under consideration. It consists of the three parishes of Pancras, Marylebone, and Paddington, with (in 1831) 240,294 inhabitants.

The parish of Pancras, now so joined to London as to constitute a part of the metropolis, is very extensive. It is bounded by Islington and Hornsey, and, in one direction, by Finchley, in which one-third of Highgate is comprised. One of its hamlets is Kentish Town, and two modern towns called Somers Town and Camden Town, form a part of it. The whole parish contains an area of 2700 acres. The houses are in general of moderate size, and not much occupied by the fashionable part of society. Within its boundaries is the fine seat of the Earl of Mansfield, Caen or Kenwood. The great lawyer, the first Lord, lived there, having purchased it of Lord Bute. The library in this house s a very fine apartment, ornamented with paintings by Zuchi, and adorned with many valuable busts and portraits. The gardens and woods are very delightful, and have some ne cedars, said to have been planted by the celebrated chief justice. The mother church of Pancras is an ancient building, probably of the fourteenth century; but the adjoining churchyard has long been remarkable for the great number of Roman Catholics that have been interred within it. Most of the tombstones have a cross and the initials R. I. P. (*Requiescat in pace*) are observable on many of them. A reason has been given for this preference, which is, that, at a church in the south of France, dedicated to the same saint, masses were said for the souls of the deceased interred at St Pancras in England. As already noticed, a new and magnificent church has been recently built. A chapel of ease has been erected in Camden Town, within the last few years. At Battlebridge is the Small-Pox Hospital, opened in 1767, and recently used for vaccination, in which more than 100,000 persons have been vaccinated. Part of it is now used as a fever-ward for those who have typhus or scarlet fevers.

Within this part are some fine squares deserving of mention. Brunswick Square is built but on three sides of a quadrangle; the eastern side being occupied by the garden wall of the Foundling Hospital. It consists of about forty comfortable, not very large houses, chiefly occupied by families connected with some branch of the law. It is connected by Bernard's Street with Russell Square, a much larger quadrangle, with an elegant garden in the centre. Many of the houses are very large, and a few of moderate size, but none small. It contains, on the whole, about sixty-eight houses, filled by most respectable families. The following squares are connected with each other by streets of modern built houses, of competent breadth, well furnished with carriage and foot ways, and kept remarkably clean at all times, viz. Mecklenberg Square, with about forty-seven houses; Bedford Square, with fifty-two; Easton Square, with seventy-two; Woburn Square, with forty-two; Tavistock Square, with fifty-five; Torrington Square, with seventy-one; and Burton Crescent, with forty-three; to which may be added Fitzroy Square, which is not far distant, and has forty houses.

This part of the metropolis, which, within the memory of many, was wholly open fields, without a house of any kind, is more remarkable for the respectability and comfort of its inhabitants, than for their splendour, taste, or magnificence. They comprise those who live on incomes already accumulated, or drawn from their professions, chiefly that of the law, or that class of traders who can afford to leave the bustle of the city, for the quiet and greater neatness of such residences. It may be estimated, that the expenditure of the families in these squares, and the streets connecting them, range, according to the size of their dwellings, and the extent of their establishments, from L. 800 to L. 2500 per annum.

There are few public buildings in the part which we are now considering, that deserve especial notice, excepting the churches, to which attention has already been directed, and two objects, which are not indeed within the boundaries of Pancras, but may be appropriately mentioned in this place.

The first is the Foundling Hospital, forming a side of Brunswick Square, opposite to the end of Lamb's Conduit Street. This beneficent institution owes its origin to a Captain Coram, who had been master of a vessel trading to the American colonies, and whose continued exertions for many years at length obtained a charter, when he began the building in 1739. The charity is not strictly for foundlings; nor are they, as in many continental cities, admitted spontaneously. The desertion of the father, and the prudent demeanour of the mother, are the best recommendation; but all applications are carefully examined by the governors, and decided on with the greatest judgment and impartiality. There are about 150 boys and the same number of girls in the house, and some of the younger at nurse, making together about 400. They are taken in during their first year, and are provided with education and all necessaries till their dismission from the establishment. On their departure they are provided with money or necessaries to the value of L. 10; and, in whatever walk of life they enter, they are sure, as long as they conduct themselves well, to find friends to assist them in the institution. Some of the boys are bound apprentices to the sea, and some to trades. The girls are taught needlework, laundry business, and fitted to become servants, and are generally provided with good places at fourteen years of age. There is a handsome chapel, where divine service is performed twice every Sunday, when a collection is made in aid of the funds, which produces liberally. The whole income is about L. 13,000.

British Museum.

The *British Museum* is one of those institutions which reflect honour on the national character. It has been established for nearly a century; the house in which it is deposited having been obtained in 1753. It had belonged to the family of the Dukes of Montague, which name it bore. Sir Robert Cotton had bequeathed to the public his valuable collections earlier, but Sir Hans Sloane, who had made large and valuable collections at the expense of more than L. 50,000, offered them to the public at less than half the money he had expended. The purchase having been completed, the two collections, consisting of various kinds of curiosities in animals, vegetables, fossils, minerals, sculptures, inscriptions, books, manuscripts, and many other objects, were united, and begun to be arranged in the magnificent pile of building still occupied by it, but recently much extended. The building, when first obtained, was situated at the very northern extremity of London, with its back close to fields, which were so solitary, that they were usually selected as the place for deciding what were called affairs of honour. It has now, however, by the extension beyond it of houses of elegant form and of capacious size, become almost a central and very accessible spot.

On entering the gate from Great Russell Street, a spacious quadrangle presents itself to the eye, with an Ionic colonnade on the south side, and the main building 216 feet long and 57 feet high on the north, the two wings being allotted for the residences of the officers. The architect, Peter Puget, a native of Marseilles, was sent over from Paris by Ralph, first Duke of Montague, solely for the purpose of constructing this splendid mansion. Capacious as this building was deemed at the time, it has been found incompetent to contain and exhibit, properly arranged, the numerous objects which have been added to the original collections. A new edifice has therefore been constructed in the garden, and is now nearly completed from designs by Mr Smirke; it forms a quadrangle 500 feet long and of just proportions, and which will, when completed, be the noblest pile in the metropolis.

From the limits to which this article is restricted, it is difficult to give even an abridgment of the valuable contents of this Museum, the synopsis of which alone fills near two hundred printed pages, and the descriptions of various departments, with the catalogues, occupy more than twenty quarto volumes. But the progress of the collection, even in an abridged form, is sufficiently interesting to deserve being sketched in this place. After the Cotton and the Sloane collections were obtained, the Harleian library and the noble acquisitions of Sir Simon d'Ewes were added, containing valuable Saxon manuscripts and other documents, with the possessions of Stowe the celebrated antiquarian. In 1767, the trustees were empowered to sell any duplicates of books, medals, or coins, and supplied with the amount to purchase others. In 1772, the Parliament voted L. 8410 for purchasing some antiquities brought from Italy, and, in 1804, L. 16,000 for building additional galleries and apartments for Egyptian and other articles; and a curious collection of antiquities from that country was bequeathed by Colonel Lethieulier. The widow of Maddox the historiographer, bequeathed the valuable collection of manuscripts which had been made by her husband. Major Edwards bequeathed many books and L. 7000 to purchase others, when the collections of Dr Birch were purchased; and, about the same time, Mr Da Costa presented many Hebrew manuscripts and several books, and Dr Cracherode a collection of the best Greek and Latin classics. Since that, additions have been made of the Greek coins of Mr R. Payne Knight, and presents of architectural and other casts from the Royal Academy. The valuable mineral collection of the Honourable C. Fulke Greville was purchased by the public, and also the rare classical library of Dr Burney. The Elgin marbles, collected during Lord Elgin's diplomatic residence in Constantinople, have been purchased for L. 35,000, and casts from them have been made and liberally presented to several public institutions in foreign countries. The Townley marbles have been a valuable addition, as well as the manuscripts of classical and other ancient authors, which belonged to that gentleman. Another addition has been made of a series of newspapers from 1603 to the present time, which form more than 7000 volumes; and also a collection of 300 or 400 volumes in quarto, forming materials for the history of the stage, and of actors and authors from the year 1600 to the present time. The most considerable accession made to the books was the library of his Majesty George III, presented to the institution by his son George IV. on his succeeding to the throne. It is highly valuable, as well for the number as for the rarity of the works, but especially of the maps. The whole is preserved in one of the magnificent rooms in the newly erected part of the building. See the article LIBRARIES.

The trustees, who have the management of this invaluable institution, are of three descriptions. The first are official trustees, consisting of the heads of the several departments of the government, of the law, of the church, and the presidents of the Royal Society, of the College of Physicians, of the Antiquarian Society, and of the Royal Academy. The second class, called family trustees, are two representatives of the Cotton family, two of the Harley family, and one each of the family of Townley, of that of Elgin, and that of Knight. The third class are called elected trustees, being chosen by the others, and include twelve names, the most distinguished in the kingdom for rank and talents.

The Museum is open to the inspection of the public from ten o'clock till four, except on Sundays, and on a few holidays, and during the months of August and September. No other regulation is made but that the visitors shall write their names and addresses in a book prepared for that purpose. A sufficient number of servants attends to preserve the valuables from injury, and to give any necessary information, and no money is allowed to be taken by any of them. Admission to the reading room may be obtained by application, in writing, specifying the name, abode, and profession of the applicant, which the librarian lays before the board at the next meeting, and if it be a person known a temporary ticket is immediately given; others must give a reference, or their application receives no attention. The tickets secure admission for six months, and must then be renewed. In the reading-rooms are convenient tables, furnished with writing materials and catalogues of the books. Any person who wishes to consult any work has only to write its title and his own name, and it is brought to him by the servant to whom the note is given (of whom there are abundance attending), with a dispatch that is not known in any other institution of the kind in Europe. Students who wish to make drawings in the galleries are admitted upon application in the same manner, but must produce a recommendation from a trustee, or from an officer of the institution, or from one of the professors of the Royal Academy. The number of visitors to the Museum, in 1834, was 237,000; the number of those who had tickets of admission to read was 70,200.

The decorations on the grand staircase and on the ceil-ng above it are worthy of observation, having been painted by artists of great skill and celebrity; and the new part the king's library is finished in the most chaste and appropriate manner. The rooms filled with mineral collections, the gallery of the Elgin marbles, and the other parts, are all calculated to excite delightful feelings.

At the beginning of the last century Marybone or Mary-ebone was a small village nearly a mile distant from any part of the metropolis. In the year 1715 a plan was formed for building Cavendish Square, and several other streets on he north side of the Tyburn Road. In the year 1717 or 1718 the ground was laid out, and a circle on the centre hen enclosed. The Duke of Chandos then took the whole northern side, intending to build a magnificent mansion, of which the two existing houses were to form the wings. Lord Harcourt and Lord Bingley took ground on the east nd west sides, and the remainder was let to builders; but he calamities which were caused by the South Sea bubble ended to retard the progress of the operations till 1726. The row of houses on the north side of the road to Tyburn was completed in 1729, and the name of Oxford Street given o it, and soon afterwards most of the streets leading to Cavendish Square and Oxford market were laid out. Mait-and says, that in 1739 there were 577 houses in the parish f Marylebone, and 35 families who kept their coaches; ut there still remained a considerable void between the ew buildings and the village, which consisted of pasture elds. Portman Square was begun about 1764, when the orthern side was built, but it was nearly twenty years be-ore the whole was finished. In 1770, the continuation of Harley Street commenced, and also Mansfield Street, the tter in a place where there was once a basin of water. Portland Place and the streets near it were built soon after-wards, and Stafford Place, in 1774, on a piece of ground be-nging to the city, on which the Lord Mayor's banqueting-ouse had formerly stood. Cumberland Place was begun bout the same time. During the war with America the ate of augmentation was very languid. But in 1786 a ew start was made, and Manchester Square, which had een commenced a few years before, was completed in 1788. Since that time the advance has been much greater nd recently more rapid. The first step was to build over hat was formerly the manor of Lilestone, but is now called isson Green, to the north-west of the other buildings. here several streets and some squares were filled with ouses, which, though upon a small scale, were for the ost ornamental and comfortable. From thence the houses ere carried on farther in the same direction to what was nown as St John's Wood, but is now called Portland Town, rom the title of the noble proprietor of the land. It is in his part that the magnificent rail-road from London to Bir-mingham has begun to be formed. Lofty mounds have been rected over valleys, and deep cuttings have been made hrough hills. The present appearance of the work, in 1836, excites surprise in the beholder, and the completion f it will become a very attractive object.

The most striking improvement which has been made in his quarter has been recently accomplished by covering ith elegant rows of buildings, villas, and other edifices, a ising piece of ground between the New Road and Hamp-tead. This land had been let on long leases by the crown, hich expired in 1814, when it was planned out for build-ing by that eminent artist, Mr Nash, and under his direc-ion accomplished in a few years. The whole has received he name of the Regent's Park. It is nearly a circle of 0 acres, laid out with shrubberies, adorned by a fine piece water, and intersected by roads, which are adapted for romenades, or for carriages. In the enclosures there are ome villas, and the greater part is surrounded with noble anges of buildings. To the south of the New Road is the remarkable pile of Park Crescent, a circular range of thirty elegant houses, in the centre of which Portland Place terminates. Across the New Road the first mass of erections is a neat quadrangular assemblage of twenty-four houses, called Park Square, on the east side of which is the adult orphan institution. To the eastward of this stands the Diorama, an object which has excited great curiosity and exquisite delight. The interior resembles that of a small theatre, the part allotted to spectators being boxes elevated three or four feet above the amphitheatre or pit. Above is a circular ceiling ornamented with transparent devices, and surrounded with medallions of eminent sculptors and painters. The whole is moveable, and is made to revolve with the spectators at intervals of a quarter of an hour, so that as one picture recedes, the other comes gradually into view. The effect produced by the disposition of the building, and by the various modifications of shade and light, renders the optical deception complete, and almost persuades the spectator that he is not contemplating a work of art. This striking production of art and of machinery was first opened in September 1823.

Near to this is the Colosseum, a name applied in consequence of the vastness of the buildings. It was erected in 1828 by Decimus Burton, and is one of the noblest edifices of the metropolis. It presents a Greek Doric portico of six columns, and is surmounted by a dome 120 feet in diameter, of which 75 feet are wholly of glass. Its form is that of a polygon with 16 faces, each of 25 feet, and the circumference of the whole building is 400 feet. The height of the walls on the outside is 64 feet, and on the inside 79 feet, whilst the sky-light of the dome is 112 feet from the ground. Beyond the entrance are vestibules, one of which leads to a saloon for the exhibition of works of art, and the other to the various galleries from which the panorama is to be viewed. There is also, in the centre of the building, a curious contrivance, by means of which visitors are raised at once to a level with the panorama, and saved the trouble of ascending the staircase. The panorama of London, which is here exhibited, far surpasses, in extent and accuracy, every thing of the kind that had before been attempted. Some idea of its size may be formed from its occupying 40,000 square feet, or nearly an acre of canvass. The various objects are depicted as seen from the top of St Paul's, where the original sketches were made, at the time when the ball and cross were being replaced. The gardens surrounding the building are laid out so as to appear much more extensive than they really are. They comprise conservatories. waterfalls, a Swiss cottage, and other interesting objects.

The next group beyond these public exhibitions is the smallest in the park, named Cambridge Terrace, consisting of ten houses, though the front appears as one building with a centre and two wings having porticos of the Roman or Pseudo-Doric order. Chester Terrace follows next, a grand and commanding range of buildings, consisting of forty houses; they are of the Corinthian order, and at each end of the terrace is an arch connecting them with the pavilion-shaped mansions. One of the finest ranges of buildings erected by Mr Nurse is considerably elevated above the road, and separated from it by a garden, round which is a sweep commanding a fine view of the park. It is named Cumberland Terrace, consisting of thirty-three houses, with a front in harmony with the whole. It has a centre and wings connected by two arches. The ground-story is rusticated, and, in the end, in the principal masses of the building, serves as a base for Doric columns, surmounted by a balustrade, on which are placed allegorical figures of the seasons, the arts and sciences, and other subjects. The central portion consists of a splendid colonnade of twelve columns, surmounted by a pediment containing sculpture, which represents Britannia crowned by fame, seated on a throne, at the base of which are figures representing valour and wisdom, and some similar emblematic subjects.

The next object, to the north, but still on the eastern side, is St Catherine's Hospital, founded by the queen of that name, the consort of Henry VIII. It was originally built near the Tower, but, upon the erection of the new docks, it was, in 1826, removed to the Regent's Park. The institution consists of a master, three brethren chaplains, three sisters, and ten poor women, who are maintained by funds provided by that queen, and increased since by other benefactions. The building is in the pointed style of architecture, and consists of two ranges, each forming three houses. In the centre is the collegiate church, elegantly fitted up within, and with a corresponding front, surmounted by two pinnacles. On the opposite side of the road is the house of the master, a handsome building surrounded by two acres of ornamental garden.

After passing Gloucester Gate, a neat structure, of the Doric order, consisting of four fluted columns, flanked by stone lodges, which leads to the great north road, the next object of attraction is the Zoological Garden. This establishment, consisting of the Gardens and the Menagerie, stands at the north-east corner of the Park. It was founded by a society of men of science in 1826, and this spot opened to the public two years after. The Gardens form a most agreeable promenade, and the collection preserved in appropriate dens, aviaries, and paddocks, is already large and constantly increasing. It is much frequented by visitors, 142,000 persons having been admitted in a year. It has been much enlarged in 1835 and 1836, and the arrival of four giraffes has drawn to it astonishing crowds.

The Regent's Canal crosses the park on the northern boundary, and over it is Macclesfield Bridge, a most elegant structure, consisting of three arches, supported by cast-iron pillars of the Doric order. On the next, or northwest side, are some elegant detached villas; that of the Marquis of Hertford is particularly an object of admiration. Hanover Terrace, on the west side, consists of nineteen houses, built by Mr Nash, forming an apparent continuous building. It consists of a centre and two wings of the Doric order, crowned with pediments surmounted by statues of the muses. In the central pediment is a group of figures in *relievo*, representing medicine, chemistry, architecture, sculpture, poetry, peace, justice, agriculture, plenty, music, history, and navigation.

Opposite this pile is a small gate, opening into the enclosed part of the park by a footpath, which winds into a serpentine form to a gate opposite to Sussex Place, and terminates at another gate fronting York Terrace. Sussex Place is rather a whimsical range of buildings, composed of twenty-four houses, consisting of a centre flanked by octagonal towers and wings with four similar towers, the whole being disposed in a semicircular form, with a garden in front. The towers are finished with cupola tops and minarets, which produce a singular effect. Near to Sussex Place is Clarence Terrace, a group of twelve houses, being the smallest in the park. It consists of two wings and a centre, of the Corinthian order, connected by colonnades of the Ionic order. Cornwall Terrace was one of the earliest ranges of building in the park, consisting of twenty-one houses. The basement is rusticated, and the upper part is adorned with fluted columns and pilasters, with well-proportioned capitals. This also is after the design of Decimus Burton. York Terrace is the largest, and one of the most splendid masses of building in the park, containing sixty-one dwelling houses, on a plan designed by Nash. The ground-story presents a range of semicircular-headed windows and rusticated piers, above which is a continued pedestal, divided between the columns into balustrades, in front of the windows of the principal story, to which they form balconies. This terrace appears more like a single palace than a row of separate dwellings, from all the doors being at the back of the buildings, and from the gardens in the front having no divisions. In the centre of the pile is York Gate, forming, with the two rows of mansions which flank it, a noble entrance to the park. Ulster Terrace, comprising seven houses at the western corner of Park Square, is a plain and simple range, adorned at the basement story with a colonnade of the Ionic order.

It has appeared desirable to give a more detailed description of the buildings in this part than can be allotted to similar objects in other parts of London, because it is unique in its plan, elegant in its execution, and, as a whole, presents a spectacle unrivalled either in Great Britain or in any of the cities of the continent.

The handsomest assemblage of houses in this district is Portland Place, terminating towards the north in an elegant circus, open to the Regent's Park. The houses are lofty, elegant, and regular, but differ somewhat in size, though none of them is small. They may be calculated for families whose expenses amount to from L.3000 to L.6000 per annum. Portland Place is about a furlong or eighth of a mile in length, and 126 feet in breadth, with a proportional breadth of foot pavement. It contains seventy-four large houses. The crescent, in which it terminates, has thirty elegant houses, and in it is a fine bronze statue of the late Duke of Kent, the work of Mr Gahagan, seven feet two inches in height, and weighing two tons.

Baker Street, which runs nearly parallel to Portland Place, is a fine street, about two-fifths of a mile in length, and containing ninety houses, besides fifty in the continuation of it, called Upper Baker Street. The houses vary much in size, but from the breadth of the street, the whole has a fine appearance. The intermediate streets between Baker Street and Portland Place, consist of neat but small houses, tolerably uniform in appearance, and are let at rents varying from L.80 to L.150 per annum. In Gloucester Place, and Upper Gloucester Place, to the west of Baker Street, are good assemblages of uniform houses, containing together 140 mansions, occupied by respectable families.

In this district are some of those fine squares which are the peculiar ornament of London, and are not to be seen in equal extent or elegance of building in any of the cities of the continent. Cavendish Square, the oldest of them, is adorned by a statue of William Duke of Cumberland. It contains several magnificent mansions, and a few of inferior extent. The total number of houses is thirty-seven. In the centre is a garden surrounded with iron palisades. Portman Square, with numerous streets around it, is built upon the estate of the Dorsetshire gentleman whose name it bears, and the value of it will be prodigious, when the present leases of the houses shall expire. The square contains forty first-rate houses, with a neat garden, of an oval shape, in the centre. Manchester Square, though of smaller extent than the others, and with houses of not quite so expensive a rate, is well built and neat. The north side is nearly occupied with the magnificent mansion of the Spanish Embassy, and near it is a handsome Roman Catholic chapel, very fully attended. It contains, besides the Spanish house, twenty-six others. Grosvenor Square is one of the oldest and most distinguished of the metropolis, as well for the size and the architecture of the houses, as for the number of the highest ranks of the nobility who reside in it, and the taste displayed in laying out the garden and shrubbery in its centre. It was built in 1726, by Sir R. Grosvenor. It contains six acres of land, and forty-four magnificent houses. In the centre is a gilt equestrian statue of King George I., executed by Van Nost.

Paddington.

The village of Paddington was about one mile from Tyburn, but by the great increase of houses of late years, it is now an undistinguishable portion of London. It, however, extends to the westward, and includes within its parochial boundaries the hamlet of Bays Water, and the part called Craven Hill. The parish was in ancient times a portion of the estate of the Abbot of Westminster, and the present church was then a chapel of ease to the church of St Margaret's, Westminster. The parish church in the centre of the green was consecrated in 1791. It is a handsome building upon a Grecian model, with a portico of the Doric order, and towards the south end a cupola on the top.

The general increase of inhabitants in this parish from 1800 to upwards of 15,000, has been in a great measure owing to the completion of the Grand Junction Canal, the company having constructed a capacious basin with wharfs and warehouses, in which a vast deal of business is transacted. The situation is very favourable to the extension of good houses, and accordingly many of those have been erected within the few last years in the different squares, streets, and places which have been constructed. Bryanstone, Dorset, and Montague squares are neat assemblages of houses, letting from L.160 to L.260 per annum. Cumberland Street, and others near it, present very elegant buildings, as do Connaught Terrace and Place, looking into Hyde Park. One portion is filled with villas, upon a small scale, in gardens known as Alpha Cottages, whilst beyond them, in what was called St John's Wood, and now destined to bear the name of Portland Town, new streets are laid out, which will probably, in a few years, be filled with handsome houses, and with numerous inhabitants.

The Clergy's Orphan School is now established in St John's, Wood-road. It is an old institution, established in 1749, but of late greatly increased, and incorporated in 1809, for the clothing, maintaining, and educating the orphan children of the clergy of the Established Church. A fine building has been erected, which is an ornament to the spot, and the institution is well and economically conducted.

One of the most striking objects in this new part of the metropolis is the Roman Catholic Church, newly erected upon a spot said to have been formerly occupied by the Knights of St John of Jerusalem. It has been built and endowed with funds for its maintenance by two pious sisters of the name of Galini. It is built in the style of the pointed architecture of the thirteenth century. The front is deemed one of the best modern adaptations of the materials furnished by our ancient ecclesiastical architecture that London presents; and, whilst the style is strictly adhered to, the composition is original, though the materials are taken from existing examples. The length of the church within the nave is 110 feet, that of the aisles 99 feet; the breadth of the body of the church is 44 feet, and the height 44 feet.

The basin of the Grand Junction Canal, the new market formed near it, and the large warehouses, have brought a great degree of trade to this quarter; whilst the Regent's Canal, which communicates with it, renders the conveyance of coal and other heavy substances cheaper than formerly.

One part of Paddington approaches near to the Royal Gardens and the Palace of Kensington. Kensington Palace, so called from its vicinity to the village of that name, stands within the parish of St Margaret's, Westminster. It was originally built by Sir Heneage Finch, afterwards Earl of Nottingham, and Lord Chancellor. His son, the second Earl, sold it to King William III. soon after his accession to the throne. This palace has been successively inhabited and improved by Queen Anne, and the two first Georges of the present dynasty. King William, Queen Anne, her consort George Prince of Denmark, and George II. here expired. During the first part of the reign of George III. none of the royal family made it their residence; but of later apartments have been assigned in it to the Duke of Sussex, who still occupies them, and since that time, another considerable part has been, and still is, occupied by the Duchess of Kent and her daughter the Princess Victoria, heiress-presumptive to the throne. The palace is a large irregular edifice, built at various times of red brick. The principal entrance is on the west side, and leads to some elegant and spacious apartments, one of which, called the cube-room, is 37 feet square. There are two fine galleries, one called the King's, 94 feet by 21; and the other called the Queen's, 84 feet by 21. The palace contains some pictures by the old masters, and many portraits. The great staircase, and the several ceilings, painted by the artist Kant, are much admired. The charm of this palace consists in the gardens in which it is placed, and which form a most refreshing resource to the inhabitants of London. They are more than three miles in circuit, and have, in addition to pure air, that variety of lawn, shade, and water, which make them a most delightful promenade; in summer a band of good music plays, and it is altogether one of the most agreeable, as well as most frequented, promenades in the vicinity of the metropolis.

Chelsea.

In the way from this to London, but a little to the south, is the large and populous village of Chelsea. Chelsea College was originally built in the reign of King James I., and was intended to be maintained as a polemical school of divinity. It was incorporated for that purpose in 1610, and consisted of a provost and twenty fellows, of whom eighteen were required to be in holy orders, and the other two, who might be either laymen or divines, were to be employed in writing annals of the times. Dr Sutcliffe was the first provost, and Camden and Haywood the first historians. Sutcliffe, who had counted upon voluntary supplies, and also on the effect of the king's letter, was to a great extent disappointed, and having proceeded far in the undertaking, was reduced to ruin. In consequence of a chancery suit the unfinished building fell to the crown, and in the civil war to ruins. After the Restoration, Charles II., in 1669, granted the site and the ruins to the Royal Society, at that time incorporated; but, having no funds to build with, it was again sold to the crown in 1682 for L.1300. It was then determined to erect an hospital for the reception and maintenance of maimed and superannuated soldiers. Sir Christopher Wren was the architect, and the work was completed in the year 1690, at the cost of L.150,000. Many of the nobility and clergy contributed largely, and donations have ever since been continually flowing in from various quarters. It is a fine building, with a front of 790 feet, and the gardens and ground are forty acres in extent. It is three sides of a quadrangle, in the centre of which is a bronze statue of the king who founded it. The east and west sides are occupied by the pensioners, who amount to upwards of 400 men, and are well clothed, lodged, and fed. The centre is on one side occupied by the chapel, and on the other by the halls; the former has a fine altar-piece, and the latter an historical painting by Sterrio, and also Ward's picture of the Battle of Waterloo. The governor has a spacious house with a state-room, containing portraits of Charles I. and II., of William III. and his consort, and of George II. and George III. Adjoining to it is an appropriate infirmary for the diseased.

Near to the hospital is the Royal Military Asylum, an institution for the maintenance of the orphan children of soldiers. It is an extensive and handsome building, forming three sides of a quadrangle. The principal part, which is on the west side, has a noble portico of four Doric pillars, supporting a pediment with the imperial arms. The centre consists of dining and school-rooms, and a dormitory. On the top is the telegraph, which communicates between the Admiralty and Portsmouth and Plymouth. This establishment at one time was a refuge for 700 boys and 300 girls, but has of late, from economical motives, been much reduced.

The new church at Chelsea, dedicated to St Luke, has already been noticed; and the old church of St Luke is now by law made a chapel of ease to the new building. In it, and the burial-ground surrounding it, there are many old and curious monuments to distinguished persons who have been interred there. This large parish, containing 35,000 inhabitants, has, by act of parliament, been divided into Upper and Lower Chelsea, as far as regards ecclesiastical matters, and a new church for the former has been erected in Sloane Street. It is a neat building, with two spires, and is capable of accommodating 1200 persons. It is dedicated to the Holy Trinity.

A small brook, now covered with an archway, divides Chelsea from the city of Westminster. A part of the parish of St George's, Hanover Square, is the first place which is entered on that side. A few years ago it was a large piece of swampy land belonging to Lord Grosvenor, since created Marquis of Westminster. It has been recently built upon, and already exhibits by far the best squares and streets of the metropolis, whilst engagements are entered into, and proceeding towards completion, which will in a few years render this a most striking mass of splendid houses.

Belgrave Square is completed, and is the most admired part of the undertaking. It is 684 feet long, and 617 wide; each of the fronts inward are uniform, and is adorned with columns of the Corinthian order. The centre houses are very magnificent; those on both sides of them are similar, but not so large, and all are finished in the most elegant manner. The latter have been sold for about L. 10,000 or L.12,000 each, when finished. Eaton Square, which is not yet completed on the south side, will form a parallelogram of 1637 feet by 371, with elegant gardens in the centre, and the beautiful portico of the new church of St Peter at the end. The streets leading from Belgrave Square, or near to it, are all new, and the houses are elegantly constructed. Wilton Crescent and Street have a tasteful appearance, and near them a new square is about to be built, to be called Lownd's Square, connected with Knightsbridge. On the south, between Eaton Square and the Thames, it is proposed to construct a new pile of buildings, to be called Chester Square. The whole of this district has been much favoured by a new access to that part of Westminster, where the two Houses of Parliament and the courts of law are situated, through the Birdcage Walk in St James's Park.

Buckingham Palace.

One of the most prominent objects in this district is the King's Palace in St James's Park, heretofore distinguished by the name of Buckingham House, from the noble proprietor John Sheffield, Duke of Buckingham, who erected a residence in what was then called the Mulberry Garden, in 1720. On the marriage of Queen Charlotte, the mother of his majesty William IV, this house was settled upon her; she continued her occupation of it many years, when it obtained the name of the Queen's Palace, and all her children were born there, with the exception of the oldest, afterwards George IV.

With a view to reparation, as was at first announced, money was voted by Parliament; but by some change of plan, instead of repairing the ancient building, a new one has been erected at the expense of nearly L. 700,000, exclusive of what may be required to finish and furnish it in a manner suitable for a royal residence. It is expected to be habitable by the end of the year 1836.[1]

This great work was designed by the late Mr Nash, but, before his death, it was superintended by Mr Blore, who made considerable alterations in the plan of his predecessor. The grand entrance of the palace looks on the canal in the park, and the view terminates with the building of the Horse Guards. It is through an arch of white marble, in imitation of that of Constantine in Rome, and is ornamented with sculpture, by Westmacott and Bailey. A semicular railing, ornamented with mosaic gold, extends to the two wings. The body of the palace is a parallelogram, from each end of which a wing is extended, thus forming three sides of a square. At the termination of the left wing are placed fine statues of History, Geography, and Astronomy, and on the right wing of Painting, Music, and Architecture. The pediment in the centre contains the royal arms, above which are statues of Neptune, Commerce, and Navigation. Around the whole of the building, and above the windows, is a frize, combining in a scroll the Rose, the Thistle, and the Shamrock.

The entrance hall, though low, is very splendid. It is paved with variegated marble, bordered with a scroll of sienna, and centered with puce-coloured rosettes. The walls are of scagliola, and the ceiling is supported by forty-four white marble pillars, decorated with Corinthian capitals of mosaic gold. Behind the hall is a vestibule of considerable length, against the sides of which are thirty-two columns, similar to those in the entrance-hall. In the centre of the vestibule is the door of the library, a handsome suite of three rooms looking into the garden; to the right are the apartments of the Queen, and the private staircase leading to them; and to the left are the King's study, and apartments for secretaries and attendants. Returning to the hall, the grand staircase is on the left, the steps of which are solid blocks of white marble, whilst the rail is richly formed of mosaic gold and mahogany. This staircase ascends on either side, and leads to the state rooms, which are very splendid. The three drawing-rooms are decorated with blue and red imitation marble columns, surmounted by gilt capitals; the floor of the ante-room is richly inlaid with holly and satin wood. The throne-room is richly gilt, the ceiling embossed with magnificence, and the frize contains bas-reliefs by Bayley, after designs by Stothard, representing the wars of York and Lancaster. The imperial throne is placed in an alcove at the end of the apartment. From this splendid room a door leads into the picture gallery, a noble saloon running the whole length of the palace, being 164 feet by 24. It is lighted by three parallel ranges of sky-lights, decorated with tracery and oriental pendants, presenting a very pleasing appearance. Over the mantle-pieces are carved heads of the celebrated artists of antiquity, and the floor is formed of pannelled oak. The dining-room is richly adorned, but by some is deemed of insufficient capacity for royal banquets.

The front of this palace, which is the most pleasing, is that from the garden. It is chaste and simple. A sheet of water and a shrubbery have been formed before it, and the entrance this way is through the magnificent triumphal arch, designed by Nash. This arch is of the Corinthian order. Towards Hyde Park are four columns, two at each side of the arch supporting a portico. The arch itself is adorned with six Corinthian pilasters. The front towards the garden is exactly similar. The vaulted part in the centre is divided into compartments, richly sculptured. A small doorway on each side leads to the porter's apartment, within which are stairs leading to the top. Along the entablature are placed G. R. and the imperial crown. The gates, of bronzed iron-work, are beautiful, and adorned with the royal arms.

Hyde Park.

Hyde Park is entered by a fine triumphal gate, opposite to that which leads to the garden front of the royal palace. This gate, designed by Decimus Burton, and executed in 1826, consists of a screen of fluted Ionic pillars, with three archways for carriages, two for foot-passengers, and a lodge. The whole frontage is 107 feet. The central gateway is adorned with four columns, supporting the entablature, above which is a frize running round the four sides of the structure. This frize represents a naval and military triumphal procession. The side gateways present two insulated Ionic columns, flanked by antæ. The gates are beautiful specimens of bronzed iron-work, and the whole fabric has a most magnificent effect. The park consists of 95 acres in extent, and is a most valuable appendage to the metropolis, by the advantageous means of recreation which it affords both to pedestrians and equestrians. At the entrance from Piccadilly is the colossal statue of Achilles, in bronze, executed by Westmacott, cast from cannon taken by the Duke of Wellington, to whom it is dedicated, at Salamanca, Vittoria, Toulouse, and Waterloo. It stands on a base of granite, is eighteen feet in height, and is said to weigh thirty tons. One part of this park is used for reviewing troops, and another part is covered with the Serpentine River, which, when frozen, affords very great gratification to the practitioners and admirers of skating.

The finest entrance to London is by Hyde Park corner into Piccadilly. The street is nearly a mile in length (680 yards), but, from inequalities, can nowhere be seen at one view. It terminates at the other end, in the elegant circus, where the two parts of Regent Street meet, which street is exactly a mile long. At its lower end, in Waterloo Place, is the Duke of York's Column. A colossal bronze statue of that prince, executed by Westmacott, has been placed on a podium rising out of the summit of this column. It is a fine bold composition, with full drapery falling down the back of the figure, and giving it breadth and importance. The figure looks towards the parade ground of the Horse Guards, and the back consequently is presented to the view from Regent Street, and the United Service, Athenæum, and other club-houses. The column is of pale red granite, 150 feet in height, and may be ascended by a spiral staircase within. At its foot is a fine flight of steps leading into St James's Park.

Recent alterations have much improved the adjoining spot, on which Carlton Palace stood. Besides a stately range of elegant buildings upon the site of the palace, a handsome square has been formed. The front towards St James's Park consists of sixteen houses, which are disposed in two ranges, raised on a substructure, which contains the kitchens and domestic offices, forming a terrace about fifty feet wide, adorned with Pæstum Doric pillars, surmounted by a balustrade. The superstructure consists of three stories, ornamented with Corinthian columns. On descending the steps into St James's Park, the view of that pleasing ground is fine, shewing the course of the water, the islands in it, with the shrubberies and the gravel walks, as well as the road from the royal palace to the Horse Guards, by which the King passes in state to the parliament-house.

The parade place for the Guards is a fine opening, and at each side are placed trophies of war, particularly two prodigious pieces of artillery, whilst the esplanade terminates with that strong and handsome stone building, in which the troops in immediate attendance on the King are quartered, two of whom, on horseback, act as sentinels, in two lodges in front of Whitehall. In this building is the office of the commander-in-chief of the army.

On emerging from the gate of the Horse Guards, the celebrated banqueting-house, built by Inigo Jones, presents itself. It is an elegant and magnificent structure of hewn stone, adorned with an upper and lower range of pillars, of the Ionic and composite order. The capitals, and the space between the columns of the windows, are enriched with fruit and foliage. It is surrounded with a balustrade, and the whole exterior has been put in a complete state of repair. The interior consists chiefly of one apartment, of an oblong form, about forty feet in height. The ceiling was painted by Rubens, and represents the apotheosis of James I. It is now an elegant chapel, in which divine public worship is performed every Sunday. It is adorned with the eagles and other trophies taken from the French in Spain, which were deposited here with great military ceremony in May 1811. Charles I. was led from this building, through a window in the front of it, to the scaffold, where he was executed on the 30th January 1649. In the gardens between this building and the river, there are some dwellings of persons of the highest rank; and in one part a public building has been given up by the government, to form the museum of the United Services. A valuable collection has been formed, by the zeal of the officers of the army and navy, and is receiving daily augmentations. It already contains many valuable and curious objects, not only such as are connected with those professions, but also in natural history, and in articles illustrative of the customs and manners of the distant countries explored by our adventurous countrymen.

London.

Public Offices.

Between the Horse Guards and Charing Cross is the Office of the Paymaster of the Forces, which, though conveniently arranged for its intended purpose, has no peculiar claim to attention from its architecture; but, adjoining to it, is that fine pile, the Admiralty Office, built on the site of Wallingford House, and celebrated for the councils held there by Oliver Cromwell and his officers. The front has two deep wings, and a lofty portico, supported by four large stone pillars of the Ionic order. There is a screen in front of the court, richly ornamented with naval emblems. The entrance of the main building is a spacious hall, from which are passages leading to staircases, by which the numerous offices are reached. There is a fine board-room, and within the building are numerous residences for the junior lords. On the top of it is the telegraph, which maintains the correspondence with the great ports where there are naval arsenals.

In Whitehall, next below the Horse Guards, is the entrance, by a gateway common to both, and whose Gothic architecture is much admired, to the Office of the Secretary of State for the Home Department, and the Treasury Office. The first has some of its apartments looking on the street, but that part is more remarkable for its antique than its beautiful architecture. The interior is arranged very appropriately, but it is rather too small for the increased business to be transacted. The Treasury is a fine large stone building, with its front towards the Parade. It is a portion of the old palace erected by Cardinal Wolsey, and altered at subsequent periods, but chiefly in the reign of Charles II. It displays in its front the Tuscan, Doric, and Ionic order of architecture, and the whole is surrounded by a pediment. The board-room is a fine apartment; but all the other parts are too much crowded, for the number of clerks that are necessary. From this office there is a communication with the official residence of the First Lord of the Treasury.

The building next to these in Whitehall, is the elegant recently-erected Office of the Privy Council and of the Board of Trade, finished in 1826, from the design of Sir John Sloane. Upon the left hand, or western side, are the offices for the clerks of the privy council, and their subordinates, whence proclamations are issued, and patents are prepared. Upon the first floor is the beautiful court where the privy council sit as a court of law, to decide on appeals from the colonial courts, or on other business referred to them by the king. The interior is simply, yet beautifully finished, and around it are rooms for the president, and others for the advocates and agents. The right side of the building is occupied by the committee of privy council for affairs of trade. The several rooms for the president, vice-president, secretaries, and clerks, are on both sides of a gallery, which extends the whole length of the building. In the construction of this part, the architect has preserved the old board-room, erected in the reign of William III., in order to retain the beautifully carved ceiling then placed there. A communication, by a gallery, is maintained between these offices and that of the Home Secretary and the Treasury.

In Downing Street, of which the council-office forms one corner, is, on the right hand side, the house for the residence of the First Lord of the Treasury, a noble mansion, with its best apartments looking into St James's Park; and, adjoining to it, another upon a smaller scale, occupied by the Chancellor of the Exchequer, when that office and that of First Lord of the Treasury are not filled by the same individual, but otherwise by one of the secretaries of the treasury.

At the bottom of the same narrow street, but with its best front towards the Park, is the office of the Secretary of State for the Colonies and for War. The building has nothing in its exterior to engage attention, but it contains some fine apartments, and others very conveniently arranged for the despatch of business, and has been of late years extended by the addition of the house which was formerly the office of the Judge Advocate.

In the same street, touching the Colonial Office, and forming a right angle with it, is the office of the Secretary of State for foreign affairs. It has been formed out of several houses in addition to the old building, and presents to view neither regularity nor architectural beauty; in its appearance it is unworthy the dignified business there transacted, where the representatives of all the states of the civilized world have constant occasion to repair, and where the cabinet councils are most commonly held. It is, however, if not imposing, very appropriately fitted up in the interior, with noble apartments for the chief and under secretaries, where they receive the foreign diplomatists; and of late years the part occupied as a dwelling has been repaired, beautified, and elegantly furnished, and as such was first used as a residence by Mr Canning for a very short time before his death.

In Duke Street, Westminster, near to Downing Street, and looking on the Park, a new and noble building has just been finished as a State Paper Office. It has a handsome front, secured against any accident by fire, and well arranged for the purpose of preserving and rendering easily accessible the valuable documents which were removed to it from the old building in George Street. These papers can only be examined by a special order from the Secretary of State for the Home Department, which is generally granted on application, when asked, for any purely historical purpose, and every inquirer for such objects finds all the assistance he can desire upon the part of the officers of the establishment.

Houses of Parliament.

Westminster Hall has already been noticed; but the two Houses of Parliament were so much injured by the fire which accidentally broke out there in November 1834, as to render it necessary to make use of such apartments as could be most speedily converted to the purpose, for the accommodation of the two legislative bodies. A variety of suggestions have been offered for repairing or building anew the parts which were injured; but no decisive plan has been adopted, and for the present the House of Lords assembles in an apartment not very appropriate, and the House of Commons holds their sittings in what was the House of Lords, with such temporary repairs as the short time allowed for the purpose would admit. See the article WESTMINSTER.

Near to the parliament houses, in Cannon Row, is a neat and elegant building, but little seen at present, which is occupied by the Board of Controul for Indian affairs. It was built during the war for the Transport Board, which was abolished at the peace, and since that time it has been applied to its present use. It is a handsome building, with a fine portico of the Ionic order, its back front towards the Thames, and with apartments appropriately laid out.

Improvements.

Some of the greatest improvements made in the metropolis of late years have been projected or completed in the vicinity of Charing Cross, and along the Strand. All the old buildings at Charing Cross opposite to Northumberland House, including the western side of St Martin's Lane, have been removed. The new Golden Cross Inn has been completed, and the houses forming the east side of what is called Trafalgar Square are occupied. On the northern side of that square the new national gallery of painting, sculpture, and architecture has considerably advanced. It is being erected on the spot formerly occupied by the king's mews, but removed farther back, in order to give a better view from Pall Mall of the fine portico of St Martin's church. The part of the gallery towards the east has its front nearly finished, but before its completion it would be unfair to criticise the architecture. The gallery is intended to be about 500 feet in length, and will consist of a central portico of eight Corinthian columns in front and two in depth, ascended by steps at each end at an elevation of eight feet from the ground. Between the centre and the wings will be two entrances, composed of four Corinthian columns, one leading to Castle Street, and the other to the barracks. It is designed to have windows in the lower story for lighting those apartments, and in the upper story there are to be niches for statues. The portico will be surmounted by an ornamental dome, and the whole range of building by a balustrade. The part upon the right side of the portico will be devoted to the Royal Academy, and that to the left will comprise the galleries for the works of art; these being connected by the grand staircase and vestibule dividing the building into two parts.

The beautiful equestrian statue of Charles I. remains on the ancient spot, and it has been suggested that between it and the gallery some object should be placed which might do credit to the taste of the age.

The widening of the Strand, by removing Exeter Change, and many other obstructions, has made the West Strand a noble street; whilst the beautiful streets, called Adelaide Street and King William Street, have together contributed with the elegant Lowther Arcade, the Ophthalmic Hospital, the Charingcross Hospital, and many private houses, to change the character of that part of the town; especially by removing some hundreds of wretched houses, (in courts and alleys), which were the haunts of the most depraved portion of the population.

The new Hungerford Market already noticed, has now a good approach from the Strand nearly completed, which forms an additional improvement to the appearance of the western part of that street.

Somerset House.

Somerset House, or rather, Somerset Palace, is a pile of building standing on the site of a number of edifices, which were most tyrannically destroyed by the Duke of Somerset, who was protector in the reign of Edward VI., and ultimately the victim of his ambition and treason. The palace was begun in the year 1549, and the architect was one John of Padua, who was appointed in the reign of Henry VIII., under the title of Devisor of his Majesty's buildings. The architecture was that mixture of Grecian and Gothic, which had been introduced into England in the preceding reign. It was a spacious and magnificent edifice, and as by death it devolved on the crown, it was made use of as a residence for some members of the royal family. Queen Elizabeth resided here with her kinsman Lord Hunsdon. A chapel was begun by Inigo Jones, who had built the back, front, and the water gate. It was intended for the use of the Catholic Infanta of Spain, who was expected to become the wife of Charles I., when Prince of Wales; and though that match did not take place, it was used by the professors of the Catholic religion, and amongst others by the Queen Henrietta Maria. It was also the residence of the queen of Charles II., who was thereby removed from the observation of her royal consort's gallantries. It was at that time that it became he theatre of an irritating plot, probably founded on fiction, but which produced national agitation. Whether Sir Edmonbury Godfrey was murdered or destroyed himself, was, and must ever remain, a matter of doubt.

The present building is after a design of the late Sir William Chambers, and was begun in 1775. It occupies space about 800 feet wide and 300 deep, and forms a uadrangle, with a spacious court in the centre. The front owards the street consists of a rustic basement of nine rches, supporting Corinthian columns, surmounted in the entre by an attic, and, at the extremities, by a ballustrade. The key-stones of the arches are adorned with colossal masks in alto relievo, emblematical of the Ocean, and the ight principal rivers of England. On the three central windows of the first floor are medallions of George III., his Queen, and the Prince of Wales. The attic is divided into hree parts, by four statues, representing Justice, Truth, Valour, and Moderation, with the appropriate emblems of he scales, the mirror, the sword, and the bridle in one hand, nd the fasces in the other. The whole is surmounted by he British arms, supported by Fame, and the genius of ngland. The front towards the river is a spacious terrace. This river front has now two wings, built uniformly; that n the east side is a part of King's College, at the expense f which it has been recently completed, after having been ft for nearly sixty years a vacant and disgraceful spot.

The front part of the pile is occupied by the Royal Aca-emy, who have in it their annual exhibitions of painting, ulpture, and architecture. The other part, the Royal ociety, the Antiquarian Society, and the Geological So-ety at present occupy. The three other sides of the uadrangle are destined to the use of the Navy Board, the reasurer of which has an official residence looking on the ver; and some other houses in the same wing are occu-ed by Officers under the Admiralty. The Board of Taxes, ith its Secretary, have the use of a large portion; and the emainder is under the Board of Stamps, where the ma-inery is worked in their operations.

In this part of the town are a few objects which deserve otice, and which may here, as appropriately as in any other art, receive it. Covent Garden has already been noticed s a market for fruit, vegetables, and flowers. It occupies ree acres of land, covered with more elegant buildings han are usually to be seen in market-places; and it is, on the orthern, and a part of the eastern side, bounded by a range f handsome buildings, planned by Inigo Jones, on arches, ith a good walk or piazza under them. The greater part f these houses are used as taverns or coffee-houses. The hurch of St Paul, at the west end, has a fine portico, under which the elections of members of parliament for the ty of Westminster are held. This place was, in former mes, the garden of the convent of St Paul's, and was, on he suppression of those institutions, given to the family of Russell, whose successor, the Duke of Bedford, is the present possessor, and has rebuilt the centre, from plans by Mr owler, in 1829 and 1830.

Lincoln's-Inn-Fields is one of the largest squares in the metropolis; but the appearance is not favourable. The astern side has no other building but the wall of Lincoln's-Inn Garden. The north side consists of small, and mostly homely houses; but on the south and west sides are several noble mansions of considerable age, some used as offices by public boards, and others let out in chambers, like those of the Inns of Court. These houses have been inhabited by some of the most distinguished statesmen and lawyers of the country. Within the few last years Sir John Soane has presented to the public his house on the north side of the square, with the valuable collection of curiosities, which, in the course of a long life, he has been able to draw from various sources.

Leicester Square, like Lincoln's-Inn, is more remarkable for its extent than for its beauty. The greater part of the houses are upon a small scale, and not distinguished by any architectural taste. On the north side were once some distinguished edifices, particularly one the residence of Frederick Prince of Wales, father of George III., which was afterwards used for the exhibition of Sir Ashton Lever's museum. This square was the residence of Sir Joshua Reynolds, and of Hogarth, and Woollet, celebrated artists; and of John Hunter, the celebrated anatomist and surgeon. In the centre is a fine bronze equestrian statue of King George I.

In proceeding westward from Leicester Square, that singular pile of buildings, called from its form the Quadrant, is entered. It is a break in Regent Street, extending from Piccadilly to Glasshouse Street. This circular mass is ornamented by colonnades, with a good walk under a gallery surrounding the whole, which is supported by cast-iron pillars. The outward effect is fine, but the houses are not admired as residences, and have not been very advantageously occupied.

Between the Quadrant and Bond Street is Hanover Square, which was built in honour of the present royal family, soon after their accession to the throne. It occupies about two acres, has some noble houses but not in the best style, and is chiefly remarkable for a handsome suite of apartments, fitted up in the most splendid manner, and let out for the performance of concerts, or other public purposes. On the eastern side is a bronze colossal statue of William Pitt, executed by Chantrey. It is twelve feet in height, and stands on a pedestal of granite, fifteen feet high. The resemblance is very striking.

To the westward of Bond Street, Berkeley Square presents itself. There are only houses on three sides of it, as the wall of the noble mansion of the Marquis of Lansdowne, occupies the whole of the south side. The garden in the centre of the Square contains about three acres. There are in the whole, including Lansdowne House, fifty-four dwellings, several of them of the first class, but on the east side some of them are of a much lower description.

By crossing Piccadilly, St James's Square is arrived at. It has much celebrity, as well from the magnificence of several houses, and the eminent men who have lived in them, as from its being one of the oldest of the larger squares, and that which led to the practice of forming such places upon an extensive scale. On the south side, the back of some of the houses of Pall Mall, mixed with some small dwelling-houses, intrude on the view; but the other three sides are occupied by mansions of the very first class. The whole number of these is only twenty-four. The centre is a neat garden, laid out with shrubs, and, in the middle of it, there is a sheet of water, from which there rises a pedestal surmounted by a statue of King William III. The largest of the houses, are London House, belonging to the Bishop of London; and those of the Duke of Norfolk, Marquis of Bristol, Earl de Grey, Duke of Cleveland, Earl of Hardwicke, Bishop of Winchester, Earl of Dartmouth, Earl of Litchfield, Lord Rosslyn, Sir Watkin Williams Wynn, and Mr Hudson Gurney.

Palace of St James's.

The Royal Palace of St James, in Pall-Mall, has so long been treated as an object of consideration, by all the diplomatists of Europe, as to deserve a particular description. This palace was originally an hospital dedicated to St James, founded by some pious citizens before the Norman conquest. It was designed to receive fourteen lepers, to whom were afterwards added eight brethren, who were to perform divine service. It was rebuilt in the time of Henry III. The custody of it was conferred on Eton College, by a grant of the twenty-eighth year of Henry VI.; but it is reported, that the living of Chattesham in Suffolk was given in exchange for it, the college, on this consideration, having resigned it to Henry VIII. At that time the revenue was estimated at L. 100 per annum. The present building was erected by that monarch soon after the transaction, which took place in the year 1531, and was described by the historian Stowe, as "a goodly manor." The same king also enclosed the park, which became subservient to the amusement of this and the other palace of Whitehall. Charles II. who was particularly fond of it, planted the avenues, and formed the canal, and the aviary adjacent to the Bird-cage Walk, which took its name from the cages which were hung on the trees. The king, according to Cibber, was often seen here, amidst crowds of spectators, feeding his ducks, and playing with his dogs, and passing his idle time in conversation with the meanest of his subjects, which made him be adored by the common people. There exists no proof that this palace was regularly inhabited by any of our monarchs till after the fire in 1695, by which the palace of Whitehall was destroyed. James I. presented it to his promising son, Prince Henry, who resided in it until his death in 1612. Charles I. was brought to it from Windsor, on the 19th of January, by the power of the army, which had determined on his death, and his apartment was hastily furnished by his own servant, Mr Kinnersley of the wardrobe. Of the eleven days which he was permitted to live, some were spent in Westminster Hall, and the nights were passed in the house of Sir Robert Cotton, near the place of his trial. On the 27th he was carried back to St James's, where he passed his three last days in the exercise of exemplary piety. On the 30th he was brought to the place of execution; and walked, unmoved by every insult, with a firm and quick pace, supported by the most lively sentiments of religion. His son, the bigoted James, sent to the Prince of Orange, when he had approached in force near to the capital, an invitation to take up his lodging in this palace. The prince accepted it; but, at the same time, hinted to the frightened king, that he must leave Whitehall. It was customary to mount guard at both the palaces. The old hero, Lord Craven, was upon duty at the time when the Dutch guards were moving through the Park, to relieve those at Whitehall, by order of their master. From a point of honour, he determined not to quit his post, and was preparing to maintain it; but, receiving the commands of his sovereign, he reluctantly withdrew his party, and marched away with sullen dignity.[1]

During the reign of King William, this palace was fitted up for the residence of the Princess Anne, afterwards queen, and her husband Prince George of Denmark; and from that time to the present it has been regularly the court of the successive monarchs. Pennant, who described it about fifty years ago, and from whom a part of the preceding account is extracted, says, "Uncreditable as the outside of St James's Palace may look, it is said to be the most commodious for regal parade of any palace in Europe. The furniture of this palace is unbecoming the place." In this last respect very great improvements have been effected since that author took his interesting walks through London. It is still an irregular brick building of no external beauty, the front of a small part of which, in the form of a gateway, alone appears from the street, but the state apartments look towards the park. These are but one story in height, and appear tolerably regular, though somewhat mean. The south-east wing, in which were the apartments of the maids of honour, was destroyed by an accidental fire in 1809, and has not since been rebuilt. Between 1821 and 1824 the whole of the state apartments have been completely repaired and newly furnished, and thus put in the state now to be described.

These apartments are entered by a passage and staircase of great simplicity. The walls are distempered, of a dead stone colour, and are lighted by Grecian bronze lights, with moon shades placed on plain granite pedestals, which have an air of quakerly neatness, quite in unison with this part of the edifice. The exterior walls are sprinkled with black, in imitation of granite. On ascending is seen a sort of gallery or guard-room, converted into an armoury, the walls of which are decorated with daggers, swords, and musquets, in various devices. When a drawing-room is held, this apartment is occupied by the yeomen of the guard in full costume, with their battle-axes in their hands. The next room is a small chamber covered with tapestry, in fine preservation, from the ceiling of which an elegant chandelier depends. When a drawing-room is held, a person attends here to receive the cards containing the names of the parties to be presented, with the circumstances under which the presentation takes place. A duplicate of the card is subsequently handed to the lord in waiting, in order to prevent the introduction of improper persons. The next is the first of a succession of apartments, the last of which is the Presence Chamber. It is fitted up in a style of magnificent splendour. The walls are covered with crimson damask, and the window curtains are of the same material. The cornices and basements are formed of broad carved and gilt moulding, and extend to every part of the room. On entering, the eye of the spectator is first attracted by a looking-glass of unusual magnitude, which reaches completely from the ceiling to the floor. At the east end of the room is a painting of George II. in his parliamentary robes, and on the other walls hang two large pictures of Tournay and of Lisle. The furniture consists of sofas, ottomans, and stools, covered with crimson velvet trimmed with gold lace. From the ceiling hangs a superb or-molu lustre, containing two rows of lights of three branches each; and at each end of the apartment are two splendid candelabras elegantly gilt, calculated to receive twelve lights each.

The next room is fitted up in the same style of decoration, and contains an excellent full-length portrait of George III. in the robes of his order. On each side of these are two paintings of the celebrated sea-fights of Lord Howe on the first June, and of Lord Nelson at Trafalgar. The brilliant effect of the whole is considerably heightened by the addition of three magnificent pier-glasses, reaching from the floor to the ceiling. From the middle of the ceiling also hangs a delicately chased Grecian lustre.

The third and last room is the Presence Chamber, in which the king holds his drawing-rooms. This, in point of gorgeous decoration, far exceeds that of the preceding apartments, although the style is somewhat similar. The throne is splendid, and, in point of size and magnificence of effect, far exceeds that in the House of Lords. It is composed of rich Genoa velvet, thickly covered with gold lace, and is surmounted by a canopy of the same material, on the inside of which is a star embroidered in gold. There are three steps for his Majesty to ascend, which lead to a state chair of exquisite workmanship; close to which is a footstool to correspond. Over the fire-place is a full-length portrait of George IV. in his coronation robes, by Sir Thomas Lawrence. Upon each side of this picture are paintings of the battles of Vittoria and Waterloo. The piers of the room ndon

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[1] James, the son of James II, who so long made pretensions to the British throne, was born in the room now called the old bed-chamber, at present the antichamber to the levee room. The bed stood close to the door of a back stair which descends to an inner court. It certainly was very convenient to carry on any secret design, and might favour the silly warming-pan story, had not the bed been surrounded by twenty of the privy-council, four other men of rank, and twenty ladies, besides other attendants. James, with imprudent pride, neglected to disprove the tale, and it was adopted by a party, and perhaps believed by some credulous zealots.

are entirely fitted up with plate-glass, before which are some beautiful marble slabs. The window curtains are of crimson satin, trimmed with gold-coloured fringe and lace. The cornices, mouldings, &c. are richly gilt, and the other embellishments and furniture, of corresponding elegance, present a coup d'œil in every way suited to the dignity and splendour of the British court.

Behind the Presence Chamber is his Majesty's closet, in which he gives audience and receives the members of his own family, foreign ambassadors, cabinet ministers, and officers of state. It contains a state chair and footstool; an elegant writing-table with a buhl inkstand, and other useful furniture. The king's dressing or private room is beyond this. The dining-room belongs to another suite of apartments, and is admirably fitted up and furnished. Many of the sleeping-rooms are in the house built by William IV. when Duke of Clarence, which has been united by a gallery with the palace. Some members of the royal family have suites of apartments within the palace, as well as the great officers of the household and the guards on duty. There is a chapel for the household and also a German chapel, where divine service is performed after the Lutheran form in the German language.

beth

In passing by Westminster Bridge to the right bank of the Thames, we reach the newly erected borough of Lambeth, where the palace belonging to the Archiepiscopal see of Canterbury is well entitled to notice.

Lambeth, in the earliest period of which there are any accounts, was a royal manor, and had a palace, in which King Hardycanute died, after a feast, in 804, and where Harold is said to have seized the crown, and placed it upon his own head. It was then a part of the estate of Goda, who became successively the wife of Walter Earl of Mantis, and of Eustace Earl of Boulogne; she presented it to the church of Rochester, but reserved to herself the ecclesiastical patronage. It became, in 1197, the property of the see of Canterbury, by exchange with Rochester; but the bishop of the latter preserved a small piece of land, on which a house was built for the residence of the bishops, when they were attending on parliament, called Rochester Place. One of the bishops, John de Shepy, in 1357, built Stangate Stairs, to accommodate himself and his retinue, when he had occasion to cross the river to Westminster.

The palace had been built by Bishop Boniface near two centuries before, but, between 1414 and 1443, was much improved by the munificent Bishop Chichley. He founded the Lollards' Tower, which was a prison for those suspected of heresy, in which are still to be seen rings, to which it is said the followers of Wickliffe were fastened when tortured. Hilsley and Fisher occupied this palace when it fell into the hands of Henry VIII., who exchanged it with the Bishop of Carlisle for some houses in the Strand, and it was then known by the name of Carlisle House.

During the civil wars in the reign of Charles I., Lambeth, like other ecclesiastical property, suffered severely. The fine works of art, and the sacred memorials of the dead, were in most cases sacrificed to puritanical barbarism; so that when, after the restoration, Juxon was appointed to the see, he found it a heap of ruins. During his short primacy, he did much to restore it to its former condition, and built a noble apartment, which was afterwards converted into a library.

The founder of the library was Archbishop Bancroft, who left to it all his books, as did his successor Abbot; and it has been increased by the several eminent prelates who have since filled the see, so that at present the collection contains more than twenty-five thousand volumes, besides many valuable manuscripts. (See the Article LIBRARIES.) When the long parliament had abolished episcopacy, and the palace was delivered to one of their party, the regicide cott, this valuable library was preserved from destruction, or at least from dispersion, by the discreet and dexterous management of the celebrated Selden. It appears by the bequest of Bancroft, that, in the event of his successors failing to give bond to deliver the books entire from one to the other, they should be given up to Chelsea Hospital. Two years after the execution of Archbishop Laud, the books still remained at Lambeth, when Selden, alarmed for their safety, suggested to the University of Cambridge their right to them. On the claim being made, it was acquiesced in, and the whole were removed to Cambridge. Juxon made application to have the books restored to the original repository, and, though not immediately surrendered, they were so soon afterwards, when Archbishop Sheldon filled the see. That prelate, as well as Tennison, Secker, and Cornwallis, made several additions of considerable value to the library; and almost every one who has held the dignity has been a contributor to the store. This noble collection of books, now exceeding 25,000 volumes, is placed in Juxon's hall, a fine apartment, forming part of the ancient palace. There is a chapel and a vestry adjoining, in which are many portraits of several prelates, and in the banqueting-hall are portraits of all the archbishops from Laud to the present dignitary. By the magnificence and taste of the present archbishop, the domestic part of the palace has been greatly enlarged; a new Gothic wing of great beauty, designed by Mr Blore, having been erected at an expense of more than L.52,000. The whole of the interior is fitted up in a style of simple beauty, oak pannelling pervading the edifice, and contrasting finely with the fretted ceilings and ornaments. The study of the archbishop is a noble apartment, forty feet by twenty; the drawing-room is also of fine proportions, commanding, from the ample bay-window, a pleasing prospect of the gardens, and a peep at the abbey and the bridge through the foliage.

London.

Not far from Lambeth is the Surrey Zoological Garden, in which there is a collection of various animals, with a den and pole for bears, a cottage for the wapiti and camel, a ruin for eagles, folds for deer, and a variety of sheds, &c. for various beasts and birds. There is a fine piece of water, and an elegant circular glass-house surrounding the cages of the animals. The whole is laid out with much taste, and excites great delight in the visitors.

Corporation of London.

Though the government of the far greater portion of the metropolis is under the immediate direction of the Secretary of State for the Home Department, and is administered by means of the magistrates and the police; yet that part which is usually denominated the city, and which is in the strictest sense London, is under the superintendence of an ancient corporation, which possesses great power and extensive property, and is therefore entitled to a somewhat minute description.

The rise of the corporation has already been traced, in the historical view at the commencement of this article. In its frame it bears a strong resemblance to the British constitution. It is composed of three grades; of a Lord Mayor, the executive officer, of a permanent body, the court of aldermen, and an annually-appointed body, the court of common-council In the latter body the aldermen have seats and votes, and therein it differs from the relation that exists between the Lords and Commons. All of these are chosen by the citizens by a majority of votes, when the choice is not determined by the show of hands. The Lord Mayor is chosen annually, but is capable of being re-elected. The right of voting for this dignity is restricted to those freemen who have been admitted into the livery of their respective companies. The restrictions on the choice are, that the person proposed to fill it must be an alderman, must have previously served the office of sheriff, and must be one of two chosen by the livery, and returned to the court of aldermen, who finally determine which of the two shall be invested with the dignity. The aldermen are appointed during life. They are chosen for a particular division of the city, called the ward, and in the election all resident freemen are entitled to a vote, whether they have been admitted into the livery of their companies or not. After the election, however, the court of aldermen has the power of rejecting the individual as a member of their body, in which case the election is declared void, and another must be made choice of. If, at the second election, the same person have a majority of votes, those votes are considered as null, and the next on the poll is invested with the dignity. From this choice an appeal may be made to the Court of King's Bench, when the reason for the rejection must be made out to the satisfaction of that tribunal, as happened in the only instance which occurred in modern times. The city is divided into twenty-six wards, each of which has its alderman, and a deputy appointed by him. One of these wards, called the Bridge Without, which was composed of the houses standing on London Bridge, has long ceased to contain any habitations, and the senior alderman is always removed from the ward which chose him, and is installed as alderman of the Bridge ward, and his former place filled by a new choice.

The whole of the common council is chosen on St Thomas's day for the succeeding year; but the former members may be, and for the most part are, rechosen. As the extent of the several wards differs very materially, so does the number, but not in exact proportion, of their representatives in the court of common council. The wards of Bassishaw and Lime Street have four each; Portsoken has five; Aldgate, Coleman Street, Cornhill, and Queenhithe, have six each; Aldersgate, Candlewick, Cordwainers, Dowgate, and Walbrook, have eight each; Vintry has nine; Broad Street, Castle-Baynard, Billingsgate, and Langbourn, have ten each; Bread Street, Cheap, and Tower, have twelve each; Bishopsgate has fourteen; Bridge Within, fifteen; Cripplegate and Farringdon Without, sixteen; and Farringdon Within, seventeen. The ward of Bridge Without can elect none, now that it has no inhabitants. Thus the whole number is two hundred and forty, with which are combined the twenty-six aldermen, making a deliberative assembly of two hundred and sixty-six members, of which the Lord Mayor is always president. They meet in a commodious apartment at Guildhall, where the aldermen have an elevated row of seats at one end; but their votes are counted with those of the common council, who are seated on the floor. The proceedings of this assembly are conducted with regularity, the business of each day being announced to the members by printed notices. Order is maintained by the power of the Lord Mayor, who, if the debate should become intemperate, can, of his own will, close the sitting, by ordering the mace to be removed. The law-officers of the corporation, the Recorder and Common Sergeant, have seats in the court, but no votes, though they mingle in the proceedings, as far as these are connected with legal subjects.

Besides these bodies, two important offices are filled by persons who may or may not be members of the corporation. They are the two sheriffs, who are the executive officers, not only of the city of London, but of the county of Middlesex. To them all writs are directed, and they have the custody of all prisoners, and the painful duty of superintending the execution of all penal laws. It is an honourable office, but an expensive one, unless (which is said to be no uncommon practice of late) the profits of the office of under sheriff are divided between that officer and the high sheriff, who appoints him. The sheriffs are chosen exclusively by the livery, from amongst the freemen. It is customary, on a fixed festival, for the Lord Mayor to drink to the health of a number of gentlemen, which is supposed to be a recommendation of them to the office of sheriff, and such persons frequently compound by a sum of money for not being called upon to serve it. It is not, however, requisite that the health of a person should be drank in this way, as any liveryman, without notice, may propose a sheriff, and he may be chosen, by having a party of his supporters collected in the Guildhall on the day of election, when very few persons attend, if no previous expectation of a contest exists. In this way improper persons have sometimes been chosen, who would not have been elected, if any opposition, followed by a poll, had been previously arranged. In such cases, the character of the other sheriff, and the ancient practice of the city, counteract any bad influence or effect which might arise from such an appointment.

The principal legal officer of the corporation is the Recorder, commonly a barrister of eminence. He is chosen by the court of aldermen alone, and for life. He had a salary of L.2500, and besides, might practise as an advocate at the assizes in the counties; but recently, on account of the increase of business, by the act including parts of Kent, Surrey, and Essex within the city criminal court, the salary has been increased to L.3500, and he is not now allowed to practise as an advocate. Next to him is the common serjeant, who is also a barrister. He is chosen by the common council, and has a salary of L.1500 per annum. Both of these officers sit as judges in the trial of criminal offences committed either within the city of London, or the county of Middlesex, or in those parts of Surrey, Kent, and Essex, which, by the law, have been brought within the limits of the jurisdiction of the court held in the Old Bailey. The chamberlain is an officer of high dignity and ample emolument. He is chosen by the livery at large, and only for one year, but is most commonly rechosen each year, and in regard to long practice, it may be considered as an office for life. He has the care of the money of the corporation, for which he gives sufficient security. All freemen are admitted by him to their freedom upon taking the prescribed oaths; and he has the settlement of all disputes between masters and apprentices. Besides these offices are those of the city remembrancer, the city solicitor, the town-clerk, and the city comptroller, which are important and lucrative, and many inferior officers, most of whom, as vacancies occur, are chosen by the court of common council by ballot.

The dignity and power of the first city officer, the Lord Mayor, is very great. He becomes, when sworn in, the king's representative in the civil government of the city; the chief commissioner of the lieutenancy; perpetual coroner and escheator within the city and liberties of the city and borough of Southwark; chief justice of oyer and terminer, and gaol delivery of Newgate; judge of the courts of Wardmote at the election of aldermen; conservator of the rivers Thames and Medway; chief commissioner in all affairs relating to the river Lea; and chief butler to the king at the coronation, for which, as a fee, he is entitled to a gold cup, with a cover and a ewer of gold.

The office is one of the most constant attendance, and such are the restraints of its duties during the year, that whoever undertakes it, usually arranges his commercial affairs so as to be able to withdraw his attention from them altogether, and devote his whole time to the public service. A salary, in some measure appropriate to the dignity of the office, is annually allowed by the corporation, amounting to L.8000, besides the use of the magnificent mansion-house as a residence, and the splendid furniture and carriages which have been provided. In the case of liberal and hospitable Lord Mayors this sum has been considerably below the actual expenditure, but with some it has been found sufficient, and a few have been so parsimonious, that they have not nearly expended the amount voted for the support of the office.

One of the greatest occasions of expense consists in the annual procession by land and water, on what is called the

Lord Mayor's Day, the 9th of November, when he enters nto office. On that occasion the new Lord Mayor meets he aldermen, sheriffs, recorder, and other great officers, t an early hour at the Guildhall, whence, in the state car-iage, attended by them in their respective carriages, he proceeds to London Bridge, where they embark in the city tate barge, and, accompanied by the barges of the city companies, proceed up the river, and land at Westminster Bridge. The party walk to Westminster Hall, where his Lordship, after some ancient ceremonies, takes the pre-cribed oaths before the Barons of the Exchequer. He hen passes with the recorder to each of the courts in the hall, and invites the several judges to dinner on that day, when he again embarks, and the procession descends the iver to Blackfriars Bridge and there lands. From thence his Lordship is preceded by the artillery company, next o which march the company of which he is a member, and hen the other city companies in their regular order, with heir distinguishing banners and bands of music; amongst he rest, the armourers have usually persons on horseback, completely equipped in various kinds of ancient armour. To these succeed the domestics and servants of the Lord Mayor, and then the state coach, finely ornamented with abundance of gilding, and so large as to contain between he seats two stools, on one of which, facing the door, sits he sword-bearer with the sword of state, and on the other he mace-bearer carrying the city mace. The train is clos-ed by the carriages of the retired Lord Mayor, of the alder-man, the recorder, the sheriffs, the chamberlain, the common erjeant, the town-clerk, and other great officers, and the procession returns to the Guildhall. This annual proces-ion excites great interest both on land and water, and ex-hibits an extraordinary display of municipal splendour. The day closes at Guildhall by an entertainment of appropriate magnificence, at which it is common to see members of the oyal family, the most distinguished public characters, and often the ambassadors of foreign courts. About a thousand individuals take their seats at this dinner, to which they are admitted by tickets from the Lord Mayor and Sheriffs, who, in fixed proportions, bear their share of the expense, which generally amounts to about L. 3000.

Under the corporation of London criminal justice is extensively administered. At the sessions the Lord Mayor is supposed to preside even when the judges are trying prisoners, and the presence of at least one alderman is deemed necessary. The Lord Mayor sits daily at the Mansion-house for the examination of offenders, and the committal of prisoners for trial; and an alderman, on fixed days in each week, attends for the same purpose at Guildhall, the aldermen being all *ex officio* justices of the peace. There are inferior courts for the recovery of small debts, and some for the determination of civil causes, such as the Lord Mayor's Court, the Court of Hustings, the Sheriffs' courts, and some others.

The management of the great estates and other property belonging to the corporation require much attention. The care devolves on the court of common council, which, for this purpose, is divided into committees, that regulate whatever relates to the several divisions into which the property is classed, but under the ultimate direction of the general court. Each of these committees has one or more aldermen nominated as members of it, and the other members are appointed by the court in regular rotation. The committees which have the most business to transact are those of the Irish estates, of the city lands, and of the bridge estates; but there are several others, some of them permanent, and others only appointed as occasions require their formation.

This sketch of the corporation of London might have been fuller and more minute if the report of the Commissioners of Municipal Corporation inquiry had been printed. It may be proper, however, to notice the general apprehension, that all corporate bodies will, in a few years, present a different appearance from that which they have hitherto done; and that London, though the last, will certainly undergo a renovation, which may render any greater extension of this branch of our subject an unnecessary and uninteresting enlargement.

London, *New*, a city and port of entry in the United States of North America, in New London county, Connecticut. It is situated on the western bank of the river Thames, three miles from its mouth, and thirteen miles south of Norwich. The town is irregularly laid out, but has convenient public buildings, and churches for Congregationalists, Episcopalians, Baptists, and Methodists. New London harbour is the best in the state; and packets and steam-boats ply regularly between the port and New York. It is defended by Fort Trumbull on the west side of the river, and by Fort Griswold on the east side. There is likewise a lighthouse, which has been erected on a point projecting pretty far into the sound. A considerable commerce is carried on, both in the coasting trade with the southern states, and in foreign trade with the West Indies. The population amounted in 1821 to 3330, and in 1831 to 4356. Long. 72. 9. W. Lat. 41. 22. N.

LONDONDERRY, a maritime county in the province of Ulster, in Ireland, is bounded on the north by the Atlantic, on the east by the county of Down, on the south by that of Tyrone, and on the west by Donegal and Lough Foyle. The area is imperfectly triangular. Its greatest length is from the point of Magilligan, at the entrance of Lough Foyle, to Cookstown, a distance of fifty-two miles; its greatest breadth, from the western point of the liberties of Londonderry to Vow Ferry on the Bann, is forty-four miles. It extends over a surface of 518,270 acres, of which 372,667 are cultivable land, 136,038 bog or unprofitable mountain, and 9565 are under water.

According to Ptolemy, who is followed by Whitaker, the tribe of the Robogdii were located here. Afterwards it was the territory of the O'Canes, or O'Cathans, feudatories of the great O'Neil family. After the confiscation of this latter chieftain's princely estate, in consequence of his abrupt flight into Spain at the commencement of the reign of James I., this county, which formed part of its northern portion, was parcelled out amongst twelve companies of London tradesmen, by whom, or their representatives, the greater part of it is still held. Their names are the drapers, salters, vintners, mercers, ironmongers, merchant tailors, cloth-workers, haberdashers, fishmongers, grocers, goldsmiths, and skinners, forming together a body or corporation called the Irish Society. It is now divided into the baronies of Coleraine, Kenaught, Loughinsholin, and Tyrkerrin, together with the liberties of Londonderry and Coleraine, which have separate jurisdictions. In this arrangement it is remarkable that each of the two latter divisions is situated beyond what may be deemed the natural boundaries of the county, the former lying west of the river Foyle, and the latter east of the river Bann. These greater divisions are subdivided into thirty-five parishes, twenty-seven of which are in the diocese of Derry, five in that of Armagh, and three in that of Connor.

The diocese of Derry is much larger, both as to number of parishes and extent of surface, than the county, comprehending, besides the twenty-seven parishes above named as being within the civil boundary, ten in Donegal, eleven in Tyrone, and part of a parish in Antrim. By a curious anomaly, the ecclesiastical jurisdiction of the parishes in the liberties of Coleraine belongs to the Bishop of Down and Connor. The seat of the see is in the city of Derry, where is the cathedral, a building in the Gothic style, erected in 1633. The chapter consists of a dean, an archdeacon, and three prebendaries.

The neighbourhood of the great Western Ocean, and the height of the mountain ranges, which either intersect or skirt the county, may account for the fall of a considerable quantity of rain; yet the popular notion of the peculiar wetness of the climate here arises more from the frequency of showers than from the amount of water discharged by them. The maximum annual quantity of rain, during a period of seven years, did not amount to thirty-five inches, the minimum twenty-five inches. The average of rain taken during a period of seven years here and at Keswick in Cumberland, and Kendal in Westmoreland, exhibits the following results:

	Maximum.	Minimum.	Average.
Londonderry	35	26	31 inches.
Keswick or Kendal	84	34	68

Neither does it appear that the north-west wind, so prevalent here, however unfavourable to vegetable, is at all injurious to animal life. On the contrary, the most remarkable instances of longevity have been found on the coast, and in the peninsula of Magilligan. Several instances have occurred of the extension of human life to ninety and even to a hundred and ten years.

The surface of the county presents an appearance of valleys separated from each other by ridges of rugged, but not very elevated mountains, and expanding, as they approach the coast, into alluvial plains. The most elevated of the mountains are, Sawel, 2236 feet high; Slieve Gallen, 1730 feet; Cairntogher, 1521 feet; Donald's Hill, 1310 feet; Benyevenagh, 1262 feet; and Legavannon, 1290 feet.

The principal river is the Roe, which, receiving as it flows in a northerly direction the tributary streams of the Owenbeg, Owenmore, Gelvan, Castle, and Curley, discharges itself into Lough Foyle; it is subject to sudden and violent floods. The mud deposited near its mouth forms shifting banks, which prevent it from being a useful port for small craft, otherwise the channel is deep enough to be navigated for two miles by flat-bottomed barges. The Faghan rises in the south, and discharges itself into Lough Foyle near Culmore. The Moyola takes a south-eastern course, and falls into Lough Neagh. A small portion only of the fine navigable river Foyle belongs to the county, passing in its course through the liberties of Londonderry. It is navigable for vessels of large burden as far as the city of Londonderry, and thence to Lifford in Donegal for lighters of twenty tons. The Bann, from Lough Neagh, forms the eastern boundary until it approaches Coleraine, where it separates the barony from the liberties of the town. The navigation of this river is impeded by shoals, which form a dangerous bar.

The valleys formed by these rivers, and their subordinate branches, are called *slacks*. That of the Faghan presents some scenery that is peculiarly picturesque, as also does that called the slack of Feeny, a pass which connects the valleys of the Faghan and the Roe. Several glens discharge their streams into this slack; the most beautiful is that of Fin-Glen. On the western side of the ridge of Benyevenagh there is a very uncommon surface called a shaking quag, and also named the Gray Lough. It spreads over many acres. Cattle can pass freely through it in summer, yet at every step the soil yields to the pressure, communicating an undulating motion all around. The surface is broken in every direction by pits full of water of unfathomable depth, and all invariably rectangular parallelograms, very much resembling tan-pits. The quag is surrounded by declivities on almost every side, and therefore it is difficult to account for the cause of its retaining such a quantity of water without any apparent supply. The structure of its margin, formed of stratified substances covered with turf, may, however, account for the retention of the water. There may have been a large lake here, which, by the interlacing roots of the aquatic plants, is now covered with a kind of network that supports the foot, except in places where the workings of the surface produce a fissure. But the cause of this extraordinary regularity of shape in the pits thus formed still remains without satisfactory explanation. The only lake is Lough Finn, situated in the confines of Tyrone; it is of very inconsiderable dimensions. Lough Neagh touches the county in a small portion of its south-eastern boundary. The small port of Ballyronan, in the north-west angle of the lough, affords accommodation for sloops of sixty tons to load and unload. The fine inlet of the Atlantic called Lough Foyle forms the principal part of the western boundary. Having a narrow entrance, but with ten fathoms of water, between Culmore Fort and Magilligan Point, it expands itself into a gulf of fifteen miles in length and seven in breadth, with a channel fourteen fathoms deep at low water, but of difficult navigation from its great narrowness.

The soil in the northern part, along the sea-coast, is a stiff and reddish clay, interspersed with knolls of basalt, and resting on a substratum of white lime, which occasionally shows itself on the surface. Near the mouth of the Roe is an extensive tract of a marly nature, formed of layers of ouze and shells alternating to a depth of several feet. Fossil shells are frequently found in the ditches. The lands lying between the loamy soil in the low grounds and the higher wastes are either of a blue clay with fragments of quartz, slate, and a shallow covering of peat moss, or a shingle of slate interspersed with red ochreous sand or with gravel and loam. Above the lime is the region of the basalt, and the soil is thenceforth without clay, being merely an oxide of the softer parts of this ironstone, having neither cohesion nor strength, and producing little but potatoes and straw. The country people significantly call it draff land. Yet its summits are admirable as sheep walks; for, how high soever the elevation of a basaltic mountain may be, if the immediate substratum be of the fossil known by the name of zeolite trap, the soil is fertile and the herbage sweet, presenting an elegant carpeting of shamrock, daisy, butter-cup, and plantain, which is eagerly browsed on by sheep.

The valley of the Roe divides the county into two districts, totally different in respect to their geological character. On the west lies the territory of schist, on the east that of basalt, each accompanied with its peculiar fossil organization. The prevalent species of schist is a kind of flag-rock or schistose mica, next to which in quantity is the laminated schist or flag, the dip of which is generally north-west. The great mountain of Sawel is composed of several varieties of this rock, surmounted towards the summit by amorphous whinstone, interspersed with blocks of quartz. Slieve Gallen is also a mass of basalt, resting upon a bed of granite, which emerges from beneath in various places. Limestone may be found everywhere, from the sea to Benbradagh. The most remarkable cavern on the coast is in the white limestone; it is very appropriately called the Robber's Cave, having at one time been the asylum of a formidable banditti. A species of blue limestone has been used for various architectural purposes. Sandstone is universally found below the basalt, and is occasionally intermingled with schist. A species of it, of a bright tawny colour, not unlike to that of the Portland stone, is raised in large quantities near Dungiven. Many of the principal buildings are constructed of it. Coal has not yet been discovered in any quantities deserving of notice. Iron is found in great abundance, either in an ochreous state, or mixed with manganese, when it is known by the name of bog ore or woad. The base of Sawel is a mass of martial pyrites mingled with schist. To the abundance of this metal in the peat moss is to be attributed the red colour of the ashes, which are so heavy as to keep in heaps even in a breeze of wind. The metal was formerly smelted, but the operation has been ultimately relinquished as an unprofitable speculation. Copper and lead, in small veins, have been discovered. Boate states that pure gold had been found in a rivulet which discharges itself into Lough Neagh; but the fact has not been substantiated by subsequent discoveries, further than that some specimens of quartz have been observed to contain thin laminæ of that metal. Quartz and flint are common in all parts. The flint sometimes exhibits marine impressions, the quartz never. As to crystals, they are of great variety. Zeolite, in rose-cut surfaces, in points, and in thistledown, all beautiful, are common in basalt. The rock-crystals are found exclusively in the schistose regions. They are harder than those found in Kerry. In shape they are truncated prisms of six sides and six facets, and weigh from two to twelve ounces. In all the mountains composed of pyritic schist the streamlets show strong indications of iron, to such a degree, indeed, that in some places the water is not fit for drinking.

The population has increased progressively from the earliest period at which any probable estimate of its amount was made, as appears by the statements from the following authorities:—

Year.	Authority.	Number of Souls.
1760	De Burgho	46,182
1792	Beaufort	125,000
1813	Parliamentary census	186,181
1821	Ditto	193,869
1831	Ditto	222,116

The last of these estimates gives an average of one inhabitant to every two and a third acres throughout the county, or to every one and a fifth acre of cultivable land. The county was represented in the imperial parliament by eight members, two for the county at large, and two for each of the boroughs of Londonderry, Coleraine, and Newtown-Limavady. The act of union reduced the number of borough members to one each for Londonderry and Coleraine. This arrangement still continues.

The state of public education, according to the official returns in 1821 and 1824–26, is as follows:

Year.	Boys.	Girls.	Sex not ascertained.	Total.
1821,	4610	2111	...	6,721
1824–6,	5836	7925	135	13,890

In religious persuasion, the numbers stated in the latter of these returns stand thus:—Of the Established Church 2446, Roman Catholics 4494, Dissenters 6695, besides 255 whose religious tenets were not ascertained. According to the same return, the number of schools was 380, out of which, forty-nine, affording instruction to 3119 children, were supported by grants of public money; fifty-three, affording instruction to 2748 children, were maintained by the voluntary contributions of individuals or societies; whilst the remaining 278 schools, in which 8023 children were educated, depended wholly on the fees of the pupils. The diocesan school in the city affords the means of liberal education to the sons of the gentry. It is an extensive and well-conducted establishment. The endowment consists of a salary from the London Society, and a subscription from the bishop and beneficed clergy. A mercantile school in Coleraine has also been endowed by the same society.

The treatment of arable ground differs little from that generally practised throughout the province. The principal crops are barley, oats, and potatoes; the implements the Scotch and Irish ploughs; the manures sea-weed, and composts of which it forms a part, near the coast, and lime and turf-mould in the interior. In Magilligan, the mossy sands are alternately ploughed and laid up in meadow. The fiorin grass springs up luxuriantly here. Amongst the more uncommon species of grasses may be mentioned the *Parnassia palustris*, commonly called crottel, in Irish croutuil; when manufactured, it produces the litmus, turnsol-blue or archil. Extensive dairies are uncommon; the care of milk and butter forms generally a part of the domestic economy of the working farmer. Sheep are mostly brought in at fairs from other districts. There are no herds of goats in the mountains, but individually they are found in many of the habitations of the cottiers. Magilligan contains a very large rabbit-warren, extending over 1500 acres. The annual number of skins sent out of it is 2000; they are sold by auction to the Dublin hatters. The poultry are large. Geese are both large and abundant. They fatten in summer on the vetches and tares which abound in the bottoms, in autumn on the stubble, and in winter on the potato-ridge. Wild and sea fowl are abundant. The county was once remarkable for the quantity of honey it produced; latterly the produce has decreased.

The linen manufacture is the staple here, and contributes greatly to the comfortable support of the population. The yarn and linen are generally of a coarser staple than in the neighbouring county of Antrim. Sacking is made of the tow-yarn. Potteries, in which the coarser kinds of earthenware are manufactured, are carried on in some places. There are several large distilleries and breweries, and some salt-works. One of the most productive salmon-fisheries in Ireland is on the Bann, near Coleraine. Lampreys are caught at low water at the mouth of the same river. Eels are plentiful in all the streams. The sea furnishes most kinds of fish taken upon other parts of the coast. The sturgeon and sun-fish have been caught in Lough Foyle. An unique specimen of the opah or king-fish was thrown on shore upon the sands of Magilligan. Whales of various species have also been taken on the coast. The seal, porpoise, and grampus are frequent. A species of the pearl mussel has been found in the rivulet which flows through Claady into the Bann.

The residences of the nobility, and landed proprietors of large fortune, are elegant, and in some instances magnificent. Two mansions, erected by the Earl of Bristol, who had been Bishop of Derry, the one at Downhill, the other at Ballyscullion, were constructed in a style of Grecian architecture. The latter has been suffered to fall into ruin. The habitations of the farmers in some of the richest districts, where stone is scarce, are built of clay, and almost universally covered with thatch; presenting, however, with few exceptions, an appearance of comfort and good order. In all cases, they are built and kept in repair by the tenant. In the houses on the Antrim side of the Bann, the fire-place is advanced some feet from the gable-wall, so that the family can nearly sit round it. It does not appear that the nuisance of smoke is so much felt in houses thus constructed as in those in other parts of the country, in which its smell, and its action upon the eyes, are very offensive to strangers. In the districts where lime is plentiful, the outside of the cabin is whitewashed, and sometimes roughcast; whence, amongst the wildest mountains, scenes of domestic neatness often unexpectedly arrest the eye. Coal is little burned in the country parts. In the open and more fertile districts, which are consequently most thickly peopled, the peat mosses are nearly exhausted. In such situations, when the turf can no longer be cut, it is collected into heaps of wet mire, and moulded by the hand. It is then called baked turf, and makes bad fuel. Providence seems to have compensated the dreary exposure of the mountain districts, by affording them plenty of turbary, which has allured a crowded population to every arable spot, however remote or dreary, where turf is to be had in plenty. The article, when prepared for fuel, is carried down to the lowlands on slide cars, through winding ruts, which present to the inexperienced eye insuperable difficulties in the way of its transit. Bog fir is used amongst the wealthier classes as a good substitute for cannel coal. The cottier cuts it up into laths, called splits, not thicker than the blade of a knife. These are used instead of candles, and serve to give light enough to guide the operations of humble domestic industry during the long winter evenings.

The manners of the common people exhibit much kindness and courtesy. A stranger, on visiting the cabin, is offered a chair brought from the inner apartment. A remarkable tone of piety pervades their usual conversation. Few make a promise for the future without adding, "with the help of God," or some other phrase of similar import. They talk much of "the second means," and, through an over confidence in providential interference, often disregard human aids in cases of sickness. Superstitious notions are prevalent, some of them in common with those in other parts of Ulster, others more peculiar to themselves. When the cottier's cow is supposed to be "elf-shot," recourse is not had to animal medicines, but salt and water poured on three halfpence and a petrified sea-urchin called "the fairy's bullet," and common in limestone, is deemed an infallible remedy. The weasel is accounted "sawncy," that is, lucky, about the house. If a cow dies in calving, her flesh must be eaten by "Christians," and not given to the dogs. There is an almost insurmountable objection to taking an oath according to the usual form. It is most prevalent amongst the seceders, to whose prejudices in this respect the legislature has wisely yielded, by accepting their testimony on asseveration with uplifted hand. At weddings, amongst the Scotch part of the population, the bridegroom and his friends vie with each other in being the first to gallop to the house of the bride. During the race they are greeted with shots from guns and pistols in every village they pass through. A bowl of broth, called "brose," stands ready prepared at the winning-post, as the reward for the victor in the race. The forms of an Irish wedding in the mountain districts are very different. However suitable the match may be to the wishes of all parties, it is considered as but a sorry exploit unless the bride be run away with. After a few days the parties return, and a liberal carouse, to which every well-wisher of either party is expected to contribute, forms the celebration of a kind of second nuptial.

The most remarkable relic of ancient fortification is the Giant's Sconce, situated in the pass between Drumbo and Largantea. It was formed on an isolated knoll of basalt, difficult of access on all sides but the north-east, where art has supplied the deficiency by a wall of massive masonry. The interior was hollowed, as if for a receptacle for men and stores; whilst a covered way, admitting only one person in a stooping posture to pass at a time, surrounded the whole. Several cromleachs are still in existence, some of them surrounded by a circle of upright pillars, somewhat like Stonehenge. The most remarkable is that at Slacht Manus. Cairns are too numerous to admit of special notice. To the present time they are kept up, if not enlarged, by the custom of travellers adding a stone to them as they pass. Danish ditches are sometimes dug up. Sepulchral pillars are numerous, and one peculiarly remarkable stands near Dungiven. Artificial caverns, evidently constructed for the concealment of men and property, are frequently discovered. They are rudely built of stone, without cement; and flags or long stones form the roof. They consist of narrow galleries, some at right angles with the main entrance, others parallel to it. The entrance is usually concealed by a rock or grassy sod. Moats, the body of which seems to have been formed of the earth thrown out of the foss, have been found. These enclosures are too low for safety or strength, and so small as not to contain more than thirty persons. Coins, antique pins, rings, and forks, were found in one of them. Castles of acknowledged Irish erection are few. That of Carrickreagh is looked upon as amongst the most ancient. Near Ballyaghran was another. Both are said to have been residences of the family of the M'Quillans. Pieces of pit-coal, found in the cement of the walls, lead to the opinion that the operations of miners were practised in those remote ages. Some of the castellated mansions of the first English settlers, with their bawns, are still in a state of preservation; as at Killolod, Dungiven, Salterstown, and Muff.

The most ancient monastic building is the abbey of Derry, founded by Columbkill in the sixth century. The present cathedral stands on its site. At Coleraine were two monasteries, one of Dominicans, the other of regular canons. At Camus, on the Bann, was a very celebrated monastic structure, attributed to St Comgal. The only remains of it at present existing are the fort, with a pillar curiously carved. The remains of the abbey of Dungiven are the most interesting in the county. It was the burial-place of the O'Cahans or O'Kanes, several of whose tombs have resisted the attacks of time. The principal monument is that of one of the chieftains, named Cooey-na-gal. There is a tower at the north-west side of the building, and a sepulchral pillar placed on an artificial mount. A smaller tumulus in the vicinity, when opened, was found to contain an urn of earthenware with bones. The urn was surrounded with white stones. Other tumuli, when examined, exhibit similar results.

The city of Londonderry is situated at the western side of the river Foyle, near to its junction with the lough, spreading itself over the summit and sides of a hill, which here projects into the river, and which was once covered with oak trees, whence the place derived the name of Derry Calgach, "the eminence covered with oaks," which it still partially retains. Its monastery first drew inhabitants thither. The town was entirely ecclesiastical, consisting almost exclusively of churches and the dwellings of the clergy and their dependents. The English government, after having been baffled in several attempts to plant a garrison here during the war against the Earl of Tyrone, at length succeeded, in 1600, in gaining possession of the place, and securing it against any efforts of the Irish to dislodge them. It was surrounded with a substantial wall, strengthened with bastions, and had four main streets diverging at right angles from a point on the summit of the hill, now called the Diamond, to a gate at the other extremity of each. The strength of these fortifications was tested in the subsequent wars of 1642 and 1688, in each of which the town maintained a successful stand against its besiegers. After a lapse of more than two centuries, the walls still retain, in most parts, their original form and character. The external ditch, indeed, has disappeared. The gates have been rebuilt in a more elegant style of architecture, and two new ones have been added. One bastion has been removed to make way for a butter-market, and another has been appropriated as the site of a pillar commemorative of the military services of the Reverend George Walker during the memorable siege of 1688. In other respects the walls still remain unaltered, now forming the ornament, as they were once the protection, of the city. They are the favourite walk of the inhabitants, frequented by the beauty and fashion of the city, and commanding, at various points, interesting and extended views of a wooded and watered landscape. The cathedral stands within the walls, in the southern part of the city. It consists of a nave, divided into a central and lateral aisle, separated by pointed arches. The chapel of ease is a plain rectangular structure, of small dimensions. A free church, for the use of the poor, was opened in 1830, at the expense of the late bishop. There are four meeting-houses, one for the Presbyterian or Scotch church, a second for the Seceders, a third for the Covenanters, and a fourth for the Independents. There are also two Methodist chapels, and a Roman Catholic chapel capable of accommodating 2000 persons. The diocesan school is a simple but handsome stone edifice, consisting of a central pavilion and two wings. It was erected by grants from the London companies, and a large contribution from the bishop. Near to it is the parish or poor school, with accommodations for children of both sexes. The corporation hall stands in the centre of the Diamond. It is surrounded by a colonnade, with embattlements; and the same kind of military ornament surrounds its roof. The court-house exhibits much architectural beauty. The other more remarkable public buildings are, the lunatic asylum, the infirmary and fever hospital, the gaol, the custom-house, the linen-hall, the barrack, and the magazine. The bridge is the peculiar boast of Derry. It is built of wood, and extends in length 1068 feet, by a breadth of forty. A turning bridge, near the centre, admits a free navigation to vessels going up the river. Walker's Testimonial is a pillar of the Roman Doric order, surmounted by a statue of that celebrated individual. Its height is ninety feet. The markets are good, and well provided with accommodation for buyers and sellers.

The municipal jurisdiction extends over a space of three miles in every direction from the centre of the city. The government is vested in a mayor, twelve aldermen, two sheriffs, and twenty-four burgesses. The income of the corporation arises from tolls on the bridges, tolls on the market, rents of land and shambles, and tonnage and quayage.

The progress of commerce may be estimated from the custom-house receipts, which for eight years were as follow:

Years.	L.	Years.	L.
1827	14,462	1831	73,512
1828	78,595	1832	74,377
1829	74,561	1833	74,049
1830	74,856	1834	72,871

The shipping of the port of Derry in 1760 consisted of sixty-seven sail, of from thirty to three hundred and fifty tons. The following table exhibits the vessels employed in the foreign and coasting trade for eight years.

Years.	Foreign.				Coastwise.			
	Inwards.		Outwards.		Inwards.		Outwards.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
1826	59	10,450	21	5559	422	32,632	307	20,498
1827	59	9,961	24	6132	481	42,165	393	34,233
1828	39	6,686	11	2553	628	50,243	521	45,083
1829	48	7,537	14	3865	574	48,912	508	43,347
1830	64	10,989	13	2689	612	51,088	515	42,986
1831	37	6,286	10	1989	694	58,955	547	44,351
1832	50	10,310	16	4321	637	62,032	555	50,303
1833	57	11,294	22	6845	607	63,879	540	52,952
1834	57	10,406	16	4869	649	63,726	646	62,502

Hence it appears that the increase of shipping and commerce has been wholly in the cross-channel trade. Of the vessels included in that part of the table, the following were steamers:—

Year.	No.	Ton.	Year.	No.	Ton.	Year.	No.	Ton.
1829,	1	136	1831,	2	300	1833,	3	516
1830,	1	136	1832,	3	516	1834,	5	741

The population of the city at different periods has been estimated as follows:—

Year.	Authority.	Number of Souls.
1618	Pynnar	612
1690	Archbishop King	700
1792	Beaufort	10,000
1814	Irish Society	14,087
1821	Parliamentary return	9,313
1831	Ditto	10,130

Coleraine, the second town in importance, is situated on the eastern or Antrim side of the Bann, near its mouth. Like Londonderry, it owes its existence chiefly to the fostering care of the London companies. Some of the houses built of frame or cage-work in the time of Elizabeth and James I. are yet in preservation. According to the fashion of those days, they have pent-ways or piazzas. The population at present amounts to 5752 souls. The other more remarkable towns are, Newtown-Limavady, Magherafelt, Killreagh, Dungiven, Garvagh, Maghera, Moneymore, Tubbermore, Castledawson, and Bellaghy.

LONG, an epithet applied to whatever exceeds the usual standard of length in its kind.

Long-Boat, the largest and strongest boat belonging to any ship. It is principally employed in carrying great burdens, as anchors, cables, ballast, and the like.

Long-Benton, a large parish of Castle-ward, in the county of Northumberland, 281 miles from London. The population amounted in 1801 to 3355, in 1811 to 4358, in 1821 to 5547, and in 1831 to 6613.

Long Island, an island of America, belonging to the state of New York, about 120 miles in length and from ten to twenty in breadth. It extends along the coast in the form of a crescent, and is separated from the mainland by a bay which communicates with the sea at both ends, called Long Island Sound. The southern and western parts are generally of a light soil, which, when well manured, produces excellent crops of grain, especially Indian corn. Towards the east and north the land becomes hilly, and the soil much stronger, and a large quantity of wood is there raised to supply the city of New York. A considerable portion has been laid out in orchards and nurseries, and, from the general high state of cultivation in this island, it has sometimes been called the garden of the United States. It is divided into three counties, King's, Queen's, and Suffolk, and possesses many thriving towns and villages, the principal of which are Brooklyn, Jamaica, Sag Harbour, Flatbush, Flushing, Satauket, and Huntington. Brooklyn, the chief town, is a large and thriving place, situated opposite the city of New York, with which a regular communication is kept up by means of steam. It is a compact and handsome town, having several public buildings, various manufactories, a bank, and an extensive trade. To the north-east is the United States navy-yard. The population of the town in 1830 was 15,394, and that of the whole island 69,775.

Long Island, a small island, about forty miles in circumference, situated off the coast of Papua, between the ocean and Mysore island, and almost wholly unknown in the interior.

Long, *Roger*, master of Pembroke Hall in Cambridge, Lowndes professor of astronomy in that university, rector of Cherryhinton in Huntingdonshire, and of Bradwell *juxta mare* in Essex, was author of a treatise of astronomy, and the inventor of a curious astronomical machine. The latter is thus described by himself: "I have, in a room lately built in Pembroke Hall, erected a sphere of eighteen feet diameter, wherein above thirty persons may sit conveniently. The entrance into it is over the south pole by six steps; the frame of the sphere consists of a number of iron meridians, not complete semicircles, the northern ends of which are screwed to a large round plate of brass, with a hole in the centre of it. Through this hole, from a beam in the ceiling, comes the north pole, a round iron rod about three inches long, and supports the upper parts of the sphere to its proper elevation for the latitude of Cambridge. The lower part of the sphere, so much of it as is invisible in England, is cut off; and the lower or southern ends of the meridians, or truncated semicircles, terminate on and are screwed down to a strong circle of oak, of about thirteen feet diameter, which, when the sphere is put into motion, runs upon large rollers of lignum-vitæ, in the manner that the tops of some windmills are made to turn round. Upon the iron meridians is fixed a zodiac of tin painted blue, whereon the ecliptic and heliocentric orbits of the planets are drawn, and the constellations and stars traced. When it is made use of, a planetarium will be placed in the middle thereof. The whole, with the floor, is well supported by a frame of large timber." Dr Long published a Commencement Sermon in 1728, and an answer to Dr Galley's pamphlet on Greek Accents; and he died on the 16th of December 1770, at the age of ninety-one.

LONGEVITY, the same as length of life. From the different longevities of men in the beginning of the world, after the Flood, and in subsequent ages, Mr Derham deduces an argument for the interposition of a divine Providence. Immediately after the creation, when the world was to be peopled by one man and one woman, the ordinary age was nine hundred and upwards. Immediately after the Deluge, when there were only three persons to stock the world, their age was cut shorter, and none of those patriarchs excepting Shem arrived at five hundred. In the second century we find none who reached two hundred and forty, and in the third none but Terah who arrived at two hundred years; the world, at least a part of it, by that time being so well peopled that they had built cities, and cantoned themselves out into distinct nations. By degrees, as the number of people increased, their *longevity* diminished, until at length it came down to seventy or eighty years. That the common duration of man's life has been the same in all ages since the above period, is plain both from sacred and profane history. Plato lived until he was eighty-one, and was accounted an old man; and the instances of longevity produced by Pliny (lib. vii. c. 48) as very extraordinary may most of them be matched in modern histories. In the following tables are collected into one point of view the most memorable instances of long-lived persons of whose respective ages we have any authentic records.

Longford.

Names of the Persons.	Age.	Places of Abode.	When they died.
Thomas Parre	152	Shropshire	Died November 16, 1635. Phil. Trans. No. 44.
Henry Jenkins	169	Yorkshire	Died December 8, 1670. Phil. Trans. No. 221.
Robert Montgomery	126	Ditto	Died in .... 1670.
James Sands	140	Staffordshire	Ditto, Fuller's Worthies, p. 47.
His Wife	120	Ditto	
Countess of Desmond	140	Ireland	Raleigh's Hist. p. 166.
.... Ecleston	143	Ditto	Died .... 1691.
J. Sagar	112	Lancashire	.... 1668.
Simon Sack	141	Trionia	...... May 30, 1764.
Colonel Thomas Winslow	146	Ireland	...... August 26, 1766.
Francis Consist	150	Yorkshire	...... January ... 1768.
Christ. J. Drakenberg	146	Norway	...... June 24, 1770.
Francis Bons	121	France	...... February 6, 1769.
James Bowels	152	Killingworth	...... August 15, 1656.
John Tice	125	Worcestershire	...... March 1774.
John Mount	136	Scotland	...... February 27, 1766.
A. Goldsmith	140	France	...... June ... 1776.
Mary Yates	128	Shropshire	.... 1776.
John Bales	126	Northampton	...... April 5, 1776.
William Ellis	130	Liverpool	...... August 16, 1780.
Janet Taylor	108	Fintray, Scotland	...... October 10, 1780.
Susannah Hilliar	100	Piddington, Northamptonshire	...... February 19, 1781.
Ann Cockbolt	105	Stoke-Bruerne, *ibid.*	...... April 5, 1775.
James Hayley	112	Middlewich, Cheshire	...... March 17, 1781.

Although longevity prevails more in certain districts than in others, yet it is by no means confined to any particular nation or climate; nor are there wanting instances of it in almost every quarter of the globe. This appears from the preceding table, as well as from that which is here subjoined.

Names of the Persons.	Age.	Places of Abode.	Where recorded.
Hippocrates, physician	104	Island of Cos	Lynche on Health, chap. iii.
Democritus, philosopher	109	Abdera	Bacon's History, 1095.
Galen, physician	140	Pergamus	Voss. Inst. lib. iii.
Albuna, Marc	150	Ethiopia	Hakewell's Ap. lib. i.
Dumitur Raduly	140	Haromszeck, Transylvania	Died January 18, 1782. General Gazetteer, April 18.
Titus Fullonius	150	Bononia	Fulgosus, lib. viii.
Abraham Paiba	142	Charlestown, South Carolina	General Gazetteer.
L. Tertulla	137	Ariminum	Fulgosus, lib. viii.
Lewis Cornaro	100	Venice	Bacon's History of Life, p. 134.
Robert Blackeney, Esq.	114	Armagh, Ireland	General Gazetteer.
Margaret Scott	125	Dalkeith, Scotland	Inscription on her tomb there.
W. Gulstone	140	Ireland	Fuller's Worthies.
J. Bright	105	Ludlow	Lynche on Health.
William Postell	120	France	Bacon's History, p. 134.
Jane Reeves	103	Essex	St James's Chron. June 14, 1781.
W. Paulet, marquis of Winchester	106	Hampshire	Baker's Chron. p. 502.
John Wilson	116	Suffolk	Gen. Gaz. October 29, 1782.
Patrick Wian	115	Lesbury, Northumberland	Plemp. Fundam. Med. § 4, c. 8.
M. Laurence	140	Orcades	Buchanan's Hist. of Scotland.
Evan Williams	145	Caermarthen work-house	General Gazetteer, October 12, 1782.
John Jacobs	121	Mount Jura	All the public prints, Jan. 1790.
Matthew Tait	123	Auchinleck, Ayrshire	Died February 19, 1792. Edin. Even. Cour. March 8, 1792.

We have seen a list of a hundred and four persons, one of whom died under a hundred and twenty years f age, and one of whom, it is said, lived to the prodigious ge of a hundred and eighty. Of these long-lived indiviuals, forty-one belonged to England, sixteen to Scotland, nd twenty-four to Ireland.

For further information on this subject, the reader is referred to the article Mortality, Law of.

LONGFORD, an inland county in the north-western extremity of the province of Leinster, in Ireland, is bounded on the north by the counties of Leitrim and Cavan, on the east and south by Westmeath, and on the west by

Longford.

Roscommon, from which it is separated by the Shannon. It is amongst the smallest counties in Ireland, and the smallest but one as to the quantity of arable land; its contents being 263,645 acres, of which 192,506 are capable of cultivation, 55,247 are unprofitable mountain or bog, and 15,892 are covered with water.

The county, according to Whitaker, was peopled by the tribe of the Scoti, who spread themselves over most of the inland regions. Afterwards, under the name of the Annaly, it became the principality of the O'Ferrals. In the reign of Elizabeth, it was made shire-ground, being one of the seven counties into which Connaught was then divided; but it was afterwards transferred to Leinster, of which it still continues to form a part. It is divided into the six baronies of Abbeyshruel, Ardagh, Granard, Longford, Moydow, and Rathcline, which are subdivided into twenty-three parishes, all in the diocese of Ardagh, except one, which is in that of Meath.

The diocese of Ardagh, which was founded in the fifth century, was in 1658 united with that of Kilmore, from which it was subsequently separated, and, after being for some time held alone, was ultimately united with the archdiocese of Tuam, to which it is still attached; but, according to the new ecclesiastical arrangements, it is to be separated from it, and united with the sees of Kilmore and Elphin. No traces of the cathedral are now in existence. All that remained of it in the middle of last century was part of a wall built of large stones, which apparently had formed a portion of a very small edifice.

By much the greater part of the surface of the county is level, but in its northern angle it rises into bleak and rugged hills of no great elevation; and some hills also protrude in various parts of the plain country. The general surface is of considerable elevation, the summit-level of the Royal Canal, which is within the county, being 290 feet above the level of the sea. The general appearance of the country, though in many parts well planted and cultivated, presents few attractions to the lover of the picturesque. The only rivers of any size are, the Camlin, which rises near Granard, and flows by the town of Longford into the Shannon near Tarmonbarry; and the Inny, which has its source in Lough Shillin, on the borders of Cavan, passes by the southern border of the county, through a fertile and well-peopled district, and discharges itself, after a winding course, into Lough Reagh, being navigable from Ballymahon. There are several lakes within the county, but none of them of great extent. The most remarkable are Lough Gawnagh in the north, Derrylough, Lough Drum, and Lough Bannow. The fine expanse of Lough Reagh, on the western side of the county, may be considered as partly belonging to it. It has in it the islets of Innisbofin, Innisclothran, and Innismacsaint. Lough Derrymacar is merely an arm of this lake. The quantity of bog is considerable. The bog, myrtle, and larch, grow freely in it. In some of the bogs are deep holes, which throw up large quantities of water; they are known by the name of swallow-holes. In 1809, part of the bog near Johnstown burst away from the main body, and moved to a considerable distance, crossing in its passage the river Camlin, the channel of which it choked up, and caused all the adjoining lands to be flooded.

The northern boundary of the great limestone field of Ireland passes through this county. The line of division is marked by the Camlin as far as Longford town, and thence proceeds by Johnstown to Lough Shillin. To the north of this line the formation is of clay-slate and greywacké. Isolated hills of sandstone show themselves at Slievegoldry and at Ballymahon, on both sides of the Inny. Indications of iron are abundant in the northern parts. Near Lough Gawnagh very rich iron ore is found, not in thin beds, as in Leitrim and Roscommon, but in solid rocks of a dark-red colour, and it breaks into small shelving prisms. Indications of coal appear in the same neighbourhood. Marble of fine colour, and susceptible of a high polish, is raised from quarries near Ledwithstown. It is much used for chimney-pieces.

A great portion of the northern part of the county is of a rough, untractable quality, affording little encouragement for agricultural speculations; but all the more level districts, where these are not covered with bog, are of a good quality. The soil is mostly rich, and of easy culture.

The statements of the population at various periods, with the authorities on which they rest, are as follow:—

1760	De Burgho	25,142
1792	Beaufort	50,100
1813	Parliamentary return	95,917
1821	Ditto	107,570
1831	Ditto	112,391

The census taken in 1834, by the commissioners of public instruction, having been collected according to dioceses instead of counties, prevents any specification of it here. It is observable that the rate of increase diminishes considerably in the latter period of this statement; a circumstance to be accounted for partly from the greater accuracy of the mode of calculating the numbers, and partly from the increased pressure of population upon the means of subsistence. The proportion of Protestants to Catholics is as one to ten, but the number of Protestant dissenters is inconsiderable. According to the parliamentary returns, the number of children receiving education in public or private schools was as follows:—

	Boys.	Girls.	Sex not ascertained.	Total.
1821,	4798	2623	...	7421
1824–6,	5746	3385	154	9285

Of the numbers stated in the latter of these returns, 1512 were Protestants of the established church, 7621 were Roman Catholics, 136 Dissenters, besides sixteen whose religious persuasion was not known. Of the total number of schools, amounting to 180, twelve, containing 870 pupils, were maintained by grants of public money; fifteen, containing 1003 pupils, were supported by voluntary contributions of societies or individuals; the remaining 153 depended wholly upon the fees of the pupils.

The county returned ten members to the Irish parliament, viz. two for the county at large, and two for each of the boroughs of Longford, Granard, Lanesborough, and Johnstown. It now returns only two county members. The state of the constituency was as follows at three periods, viz. 1. previously to the passing of the Catholic relief bill; 2. subsequently to that measure, but previous to the reform act; 3. after the reform act, viz.

	L.50.	L.20.	L.10.	40s.	Total.
Jan. 1, 1829,	155	45	...	1362	1562
— 1830,	168	67	132	...	367
— 1832,	192	151	951	...	1294

The mode of tillage is such as is common throughout most parts of Ireland, namely, either ploughing up the lea, or manuring the surface highly and planting potatoes on it with the spade. The usual rotation of crops is, potatoes, bear, and oats. Wheat is also grown. In the vicinity of Ballymahon are some rich lands in a high state of cultivation, and tracts of excellent meadow. The low lands along the Inny produce a coarse kind of hay mixed with reeds; it is chiefly used for thatching. The black cattle and horses in the southern district are of a good kind. The breed of the former has been considerably improved by judicious crossing with the best English bulls.

The manufactures are confined to those which are necessary to supply the limited wants of an agricultural population. The principal are linen, frize, linsey-woolsey, for the garments of men and women, and leather for shoes and harness. The Royal Canal, which passes through the centre of the county, has greatly increased the inland trade.

The peasantry are a shrewd, intelligent, and industrious race, fond of manly exercises and active amusements, such as hurling, wrestling, foot-ball, and swimming. Their pastime on Sunday evenings is dancing for a cake set up on a pole. English and Irish are both spoken. The most prevalent disease is fever, particularly in the hilly districts. Its access is generally attributed to the neglect of cleanliness and the poverty of the people. The climate in general is healthy. Several persons are known to have lived to the advanced age of a hundred years.

The customs of the inhabitants deviate in few particulars from those observable in other parts of Ireland. The first day of the year, month, and week are considered as the most lucky days for commencing an undertaking. Friday is one of the cross-days, therefore every one avoids removing to a new habitation on that day. A Saturday's flitting is also said to make a short sitting. For a fortnight previous to Shrove-Tuesday, the great day for weddings, the boys amuse themselves by running in disguise through the villages, proclaiming the names of the parties about to be married, or whom they wish to have thought so. The first of May, Hallow-Eve, and Christmas, are celebrated with all the usual honours. Bull-baiting is one of the sports indulged in on St Stephen's day.

The only vestige of remote antiquity worthy of special notice is a tumulus at one end of the town of Granard, said to have been a Danish rath, and called the Moate of Granard. It commands a view of six or seven surrounding counties. Though several ruins of monastic buildings may still be traced, few memorials of their history have been preserved. The erection of those at Ardagh, Lerha or Granard, Clonebrone, and Drumcheo, is attributed to St Patrick. Those of Longford, Abbeyshruel, and Ballynasaggard, were founded by members of the O'Ferral family. Abbey Deirg was built by O'Quin. A house of gray friars, dedicated to St John, gave name to Johnstown. At Lanesborough are some ruins said to have been part of a monastery, but no historical trace of such a foundation there can be discovered. The island of Inchimore in Lough Gawnagh, and those of Innisbofin, Innisclothran, and Innismacsaint, in Lough Reagh, were each at some remote period the site of a religious house now in utter ruin.

The castle of Longford, once the mansion of the O'Ferrals, was taken at the commencement of the war of 1641, and the garrison slaughtered after their surrender upon terms. Castle Forbes, in the same neighbourhood, made a gallant resistance during the same period, under the command of the widow of Sir Arthur Forbes, until reduced by famine. Rathcline, placed in a highly romantic position near Lanesborough, was dismantled by Cromwell, and burned in the subsequent wars between William and James. The castles of Ballymahon, Barnacor, and Castlecor, were built to command passes over the Inny. Of these, the last named has suffered, not only by the ravages of time, but by excavations made in order to discover concealed money, imagined to have been buried in its interior.

The seats of the gentry are numerous. Carrickglass on the Camlin, belonging to the Newcomen family, is a fine residence; as is also Castle Forbes, the seat of the Earl of Granard. Edgeworthstown will long be noted in the annals of British literature as the residence of the Edgeworth family. Castlecor, the seat of the Hussey family, and said to have been modelled after the round tower of Windsor Castle, is more remarkable for eccentricity of appearance than architectural elegance or domestic convenience. Tirlicken was built by Lord Annaly, near the ruins of a former edifice of the same name, the seat of Sir Connel O'Ferral, which was forfeited in 1641. This county is also celebrated for having given birth to Oliver Goldsmith, a writer, the pride of his country, and the delight of elegant literature. He was born at Pallas, a village near Ballymahon, where it is said that the originals of much that he has enshrined in immortal verse in his poem of the *Deserted Village* may still be traced.

Longford, the county town, is situated on the river Camlin, in the midst of an extensive plain, interrupted only by the hill of Fenaghfadd, which rises to a height of 200 feet, at some distance south of the place. It contains a Protestant church and a Roman Catholic chapel, a gaol built according to the newly-suggested plans of classification, a court-house, an infirmary, and a market-house. It has a tolerable share of inland trade, which has latterly been much enlarged by the extension of the line of the Royal Canal through it, and also a market for yarn and unbleached linen. Here is also a brewery and several flour mills. Its population amounted in 1831 to 4354 souls. The other towns the population of which exceeds a thousand souls are as follow: Granard, 2058; Ballymahon, 1081; and Edgeworthstown, 1001.

LONGIMETRY, the art of measuring length, both accessible and inaccessible.

LONGING, a preternatural appetite for meat and drink. It is called *pica*, from the bird of that name, which is said to be subject to the same disorder. The disorder consists both in a desire of unusual things to eat and drink, and in being soon tired of one and wanting another. It is called *malacia*, from *μαλακος*, *weak*.

LONGINICO, a town of Turkey in Europe, in the Morea, anciently called *Olympia*, and famous as having been the place where the Olympic games were celebrated. The temple of Jupiter Olympus was about a mile distant from this place. It is situated on the river Alpheus, ten miles from its mouth, and fifty south of Lepanto. Long. 22. 0. E. Lat. 37. 30. N.

LONGINUS, DIONYSIUS CASSIUS, a celebrated Greek critic and grammarian, was, according to Fabricius, grandson of Cassius Longinus, who is mentioned by Plutarch (*Symp.* ix. 1); but this is a mere conjecture, unsupported by any adequate proof. The precise period of his birth is unknown, though it is not unlikely that it took place about A. D. 213, in the reign of Caracalla, as he may be supposed to have preceded by at least twenty years his pupil Porphyry, who was born A. D. 233. There is no doubt that his death took place A. D. 273, when the Emperor Aurelian took Palmyra. The place of his birth is also a matter of much uncertainty, as it is nowhere distinctly stated. The circumstance of his understanding the Syrian language, and his uncle being from Emesa in Syria, has caused some to fix on that city as his native place; and others have suspected, though with still less appearance of probability, that he was from Palmyra. His uncle Fronto enjoyed considerable reputation as a teacher of philosophy at Athens; and, amongst other pupils, he had Philostratus, who is known to us by his life of the philosopher and prophet Apollonius of Tyana, which is still preserved. It would appear that Fronto was much attached to his nephew, whom he made his heir; and from him Longinus most probably derived the rudiments of his education. In his earlier years we find, from a fragment of one of his works preserved by Porphyry in his life of Plotinus, that he travelled much, and enjoyed the opportunity of becoming acquainted with all the most distinguished philosophers of his time. He gives the names of upwards of twenty, but, with the exception of Ammonius Saccas, Origen, Plotinus, and Amelius, their celebrity was not sufficient to rescue them from oblivion. Ammonius taught the Platonic philosophy at Alexandria in Egypt, and at this time appears to have enjoyed a high reputation. The doctrines which he advocated, and his particular system, are known to us from the works of his pupil Plotinus, and the epitome of Hierocles in Photius. (*Cod.* ccxiv. p. 550.) The philosopher Origen, the master of Longinus, is not to be confounded with the Christian bishop of the same name, who was born at Alexandria, A. D. 185.

After Longinus had made himself completely master of the philosophy of Plato, which he preferred to that of every other sect, he took up his residence at Athens, and devoted himself to the instruction of youth in grammar and philosophy. Here Porphyry attended him, and derived much of that information which he afterwards employed against the Christian religion. After a long residence at Athens, he proceeded to the East, and joined Zenobia, queen of Palmyra, who had a little before succeeded to the government of the kingdom upon the death of her husband Odenathus. He became her preceptor in the Greek language, and she even consulted him respecting the administration of her affairs. Zenobia was persuaded by her courtiers that she was sufficiently powerful to refuse obedience to the commands of Aurelian, who had some time before succeeded to the Roman empire. Aurelian was more particularly amazed by the haughty style of a letter which was sent by Zenobia in answer to his demands, and which was said to have been dictated by Longinus. This letter is found in the life of Aurelian by Flavius Vopiscus (*Aug. Script.* vol. ii. p. 174, ed. Bipont.). Palmyra was taken after an obstinate siege, and Aurelian was ungenerous enough to punish him by death for the insult which had been offered to his dignity by the letter he had dictated. Longinus died without indulging in vain regrets, and in a manner worthy of his character as a philosopher, consoling the companions of his misfortunes. (Zosim. i. 56.)

He was the author of many works of criticism, but, with the exception of a few fragments, and of his treatise Πεϱι Ὕψους, On the Sublime, they have all perished. This treatise is addressed to his friend Posthumus Terentianus, and is an able disquisition on the various sources from which sublimity in writing is derived, illustrated by examples selected from the works of the most distinguished authors of antiquity. The Old Testament was not unknown to him, as he has quoted as one of the noblest specimens of the sublime, the celebrated passage in Genesis: "And God said, Let there be light; and there was light." We find also in a fragment (*E. Cod. MS. to Vat.*) that he ranks Paul of Tarsus, as he styles the apostle, with Demosthenes and the more celebrated orators of Greece. He was no doubt acquainted with the doctrines of Christianity; and the noble sentiments which he at times expresses may not unreasonably be ascribed to this circumstance. In the epilogue to his treatise, he speaks most feelingly of the corruption which pervaded every part of the world, and of the little attention which was paid to the cultivation of the intellect. The moral degeneracy of the age he in a great measure ascribes to the absence of free institutions, and quotes the well-known lines of the Odyssey, which Pope has thus translated:—

> Jove fixed it certain, that whatever day
> Makes man a slave, takes half his worth away.

It is remarkable that such sentiments should be found at this period of the world; but there can be no doubt that they were the genuine expression of his feelings. This treatise has been frequently edited, and one of the best editions is that by Hudson, Oxford, 1710. It has also been edited by Weiske, Weigel, 1809; and by Toup, Oxford, 1778. It has been translated into English by Smith, 1739; and into German by J. G. Schlosser, Leipzig, 1781, and by Von Heineken, Basel, 1784.

LONGITUDE is the distance of any place from another eastward or westward, counted in degrees upon the equator; but when the distance is reckoned by leagues or miles, and not in degrees, or in degrees on the meridian, and not of the parallel of latitude, in which case it includes both latitude and longitude, it is called *departure*.

To find the longitude at sea is a problem to which the attention of navigators and mathematicians has been directed ever since navigation began to be improved. The importance of this problem soon became so well known, that, in 1598, Philip III. of Spain offered a reward of a thousand crowns for the solution; and his example was soon followed by the states-general, who offered a premium of ten thousand florins. In 1714 an act was passed in the British parliament, empowering certain commissioners to introduce a bill for a sum not exceeding L.2000, for defraying the necessary expenses of experiments for ascertaining this point, and likewise for granting a reward to the person who should make any progress in the solution, proportional to the degree of accuracy with which the solution was performed. Ten thousand pounds were to be granted if the longitude should be determined to one degree of a great circle, or sixty geographical miles; fifteen thousand, if to two thirds of that distance; and twenty thousand, if to half the distance. In consequence of these proffered rewards, innumerable attempts were made to discover this important secret. The first was that of John Morin, professor of mathematics at Paris, who proposed it to Cardinal Richelieu; and though it was judged insufficient, on account of the imperfection of the lunar tables, a pension of two thousand livres per annum was procured for him in 1645 by Cardinal Mazarin. Gemma Frisius had indeed in 1530 projected a method of finding the longitude by means of watches, which at that time were newly invented; but the structure of these machines was then by far too imperfect to admit of their being employed for this purpose; nor even in 1631, when Metius made a similar attempt, had they undergone any considerable improvement. But, about the year 1664, Dr Hooke and Mr Huygens effected a very great improvement in watchmaking, by the application of the pendulum spring. Dr Hooke having quarrelled with the ministry, no experiment was made with any of his machines; but many were made with those of Mr Huygens. One experiment particularly, made by Major Holmes in a voyage from the coast of Guinea in 1665, answered so well, that Mr Huygens was encouraged to improve the structure of his watches; but it was found that the variations of heat and cold produced such alterations in the rate of going, that unless this could be remedied, the watches would be of little use in determining the longitude.

In 1714 Henry Sully, an Englishman, printed a small tract at Vienna upon the subject of watchmaking. Having afterwards removed to Paris, he applied himself to the improvement of time-keepers, with a view to the discovery of the longitude. He taught the famous Julian de Roy; and this gentleman, along with his son and M. Berthoud, soon turned their attention to the subject. But though experiments were made at sea with some of their watches, it does not appear that they had been able to accomplish any thing of importance with reference to the main point. The first who succeeded in any considerable degree was Mr John Harrison, who, in 1726, produced a watch which went so exactly, that for ten years together it did not err above one second in a month. In 1736 it was tried in a voyage to Lisbon and back again, on board one of his majesty's ships, during which it corrected an error of a degree and a half in the computation of the ship's reckoning. In consequence of this he received public encouragement to proceed, and by the year 1761 he had finished three time-keepers, each of them more accurate than the former. The last turned out so much to his satisfaction, that he now applied to the commissioners of longitude for leave to make an experiment with his watch in a voyage to the

West Indies. Permission being granted, his son Mr William Harrison set out in his majesty's ship the Deptford, for Jamaica, in the month of November 1761. This trial was attended with all imaginable success. The longitude of the island, as determined by the time-keeper, differed from that found by astronomical observations only by one minute and a quarter of the equator; the longitudes of places seen by the way being also determined with great exactness. On the ship's return to England, it was found to have erred no more during the whole voyage than 1′ 54½″ in time, which is little more than twenty-eight miles in distance; and this being within the limits prescribed by the act, the inventor claimed the whole L.20,000 offered by government. Objections to this claim, however, were soon started. Doubts were pretended about the real longitude of Jamaica, as well as the manner in which the time had been found both there and at Portsmouth. It was alleged also, that although the time-keeper happened to be right at Jamaica, and after its return to England, this was by no means a proof that it had always been so in the intermediate time. In consequence of these allegations, another trial was appointed to be made in a voyage to Barbadoes. Precautions were now taken to obviate as many of these objections as possible. The commissioners sent out proper persons to make astronomical observations at that island, which, when compared with others in England, would ascertain beyond a doubt its true situation. In 1764 the younger Mr Harrison set sail for Barbadoes; and the result of the experiment was, that the difference of longitude between Portsmouth and Barbadoes was shown by the time-keeper to be 3h. 55′ 3″, and by astronomical observations to be 3h. 54′ 20″, the error being now only 43″ of time, or 10′ 45″ of longitude. In consequence of this and the former trials, Mr Harrison received one half of the reward promised, upon making a discovery of the principles on which his time-keeper had been constructed. He was likewise promised the other half of the reward as soon as time-keepers should be constructed by other artists which should answer the purpose as well as those made by Mr Harrison himself. At this time he delivered up all his time-keepers, the last of which was sent to Greenwich to be tried by Dr Maskelyne, the astronomer-royal. On trial, however, it was found to go with much less regularity than had been expected; but Mr Harrison attributed this to his having made some experiments with it which he had not time to finish when he was ordered to deliver up the watch. Soon after this an agreement was made by the commissioners with Mr Kendall to construct a watch upon Mr Harrison's principles; and this was found upon trial to answer the purpose even better than any which Harrison himself had constructed. This watch was sent out with Captain Cook in 1772, and during all the time of his voyage round the world in 1772, 1773, 1774, and 1775, never erred quite 14½ seconds per day, in consequence of which the House of Commons in 1774 ordered the other L.10,000 to be paid to Mr Harrison. Since that period, however, still greater accuracy has been attained in the construction of chronometers.

Thus the method of constructing time-keepers for discovering the longitude seems to be brought to as great a degree of perfection as can well be expected. Still, however, as these watches are subject to accidents, and may thus alter the rate of their going without any possibility of a discovery, it is necessary that some other method should be employed in order to correct from time to time those errors which may arise either from the natural going of the watch, or from any accident which may happen to it. Methods of this kind are all founded upon celestial observations of some kind or other; and for such methods, or even for an improvement in time-keepers, rewards are still held out by government. After the discoveries made by Mr Harrison, the act concerning the longitude was repealed, excepting so much of it as related to the constructing, printing, and publishing of the Nautical Almanac, and other useful tables. It was also enacted, that any person who shall discover a method for finding the longitude by means of a time-keeper, the principles of which have not hitherto been made public, shall be entitled to a reward of L.5000, if, after certain trials made by the commissioners, the said method shall enable a ship to keep her longitude, during a voyage of six months, within sixty geographical miles, or a degree of a great circle. If the ship keeps her longitude within forty geographical miles for that time, the inventor is entitled to a reward of L.7500, and to L.10,000 if the longitude is kept within half a degree. If the method be by improved astronomical tables, the author becomes entitled to L.5000 when they show the distance of the moon from the sun and stars within fifteen seconds of a degree, answering to about seven minutes of longitude, after allowing half a degree for errors of observation and under certain restrictions, and after comparison with astronomical observations for a period of eighteen and a half years, during which the lunar irregularities are supposed to be completed. The same rewards are likewise offered to the person who shall with similar accuracy discover any other method of finding the longitude.

These methods require celestial observations; and any of the phenomena, such as the different apparent places of stars with regard to the moon, the beginning and ending of eclipses, &c. will answer the purpose. But it is absolutely necessary that some variation should be perceptible in the phenomenon in the space of two minutes; for even this short space of time will produce an error of forty miles in longitude. The most proper phenomena therefore for determining the longitude in this manner are the eclipses of Jupiter's satellites. Tables of their motions have therefore been constructed, and carefully corrected from time to time, as the mutual attractions of these bodies are found greatly to disturb the regularity of their motions. The difficulty here, however, is to observe these eclipses at sea; and this difficulty has been found so great, that no person seems able to surmount it. The difficulty arises from the violent agitation of the ship in the ocean, for which no adequate remedy has ever yet been found. Mr Christopher Irwin indeed invented a machine which he called a *marine chair*, with a view to prevent the effects of this agitation; but on trying it on a voyage to Barbadoes, it was found to be totally useless.

A whimsical method of finding the longitude was proposed by Whiston and Ditton, from the report and flash of great guns. The motion of sound is known to be nearly equable, from whatever body it proceeds, or whatever be the medium through which it is transmitted. Supposing therefore a mortar to be fired at any place the longitude of which is known, the difference between the moment that the flash is seen and the report is heard will give the distance between the two places; hence, if we know the latitudes of these places, their longitudes must also be known. If the exact time of the explosion be known at the place where it happens, the difference of time at the place where it is heard will likewise give the difference of longitude. Let us next suppose the mortar to be loaded with an iron shell filled with combustible matter, and fired perpendicularly upwards into the air, the shell will be carried to the height of a mile, and will be seen at the distance of near 100; and hence, supposing that neither the flash of the mortar should be seen nor the report heard, still the longitude might be determined by the altitude of the shell above the horizon. According to this plan, mortars were to be fired at certain times and at proper stations along all frequented coasts, for the direction of mariners. This indeed might be of use, and in stormy weather might be a kind of improvement in lighthouses, or a proper addition to them; but with regard to the determination of longitudes, it is evidently ridiculous.

We shall now proceed to give some practical directions for finding the longitude at sea by proper celestial observations, exclusive of those of Jupiter's satellites, which, for the reasons just mentioned, cannot be practised at sea. In the first place, however, it will be necessary to point out some of those difficulties which stand in the way, and which render even this method of finding the longitude precarious and uncertain. These consist principally in the reduction of the observations of the heavenly bodies made on the surface of the earth to similar observations supposed to be made at the centre, which is the only place where the celestial bodies appear in their proper situation. It is also very difficult to make proper allowances for the refraction of the atmosphere, by which all objects appear higher than they really are; and another difficulty arises from the parallaxes of the heavenly bodies, which make them, particularly the moon, appear lower than they would otherwise do, excepting when they are in the very zenith. It is also well known, that the nearer the horizon any celestial body is, the greater its parallax will be; and as the parallax and refraction act in opposite ways, the former depressing and the latter raising the object, it is plain that great difficulties must arise from this circumstance. The sun, for instance, whose parallax is less than the refraction, must always appear higher than he really is; but, on the other hand, the moon, whose parallax is greater than her refraction, must always appear lower.

To facilitate the necessary observations of the celestial bodies, the commissioners of longitude have caused an Ephemeris or Nautical Almanac to be published annually, containing every requisite for solving this important problem which can be put into any form of tables. But whatever may be done in this way, it will still be necessary to make the requisite preparations concerning the dip of the horizon, the refraction, semidiameters, parallax, &c. in order to reduce the apparent to the true altitudes and distances; and for this we shall subjoin two general rules.

The principal observation for finding the longitude at sea is that of the moon from the sun, or from some remarkable star near the zodiac. To do this, the operator must be furnished with a watch which can be depended upon for keeping time within a minute for six hours; and with a good Hadley's quadrant, or, which is preferable, a sextant; and this last instrument will still be fitter for the purpose if it be furnished with a screw for moving the index gradually, and likewise an additional dark glass, but not so dark as the common kind, for taking off the glare of the moon's light in observing her distance from a star. A small telescope, which magnifies three or four times, is also necessary, to render the contact of a star with the moon's limb more discernible. A magnifying glass of one and a half or two inches focus will likewise greatly assist the operator in reading off his observations with facility and despatch.

1. *To make the observation.*—Having examined and adjusted his instrument as well as possible, the observer is next to proceed in the following manner: If the distance of the moon from the sun is to be observed, turn down one of the screens; look at the moon directly through the transparent part of the horizon-glass, and, keeping her in view, gently move the index till the sun's image be brought into the silvered part of that glass. Bring the nearest limbs of both objects into contact, and let the quadrant librate a little upon the lunar ray, by which means the sun will appear to rise and fall by the side of the moon; in which motion the nearest limbs must be made to touch one another exactly by moving the index. The observation is then made; and the division coinciding with that on the vernier scale will show the distance of the nearest limbs of the objects.

If the distance of the moon from a star is to be observed when the moon is very bright, turn down the lightest screen, or use a dark glass lighter than the screens, and designed for this particular purpose; look at the star directly through the transparent part of the horizon-glass, and, keeping it there, move the index till the moon's image be brought into the silvered part of the same glass. Make the quadrant librate gently on the star's ray, and the moon will appear to rise and fall by the star; move the index between the librations, until the moon's enlightened limb is exactly touched by the star, and then the observation is made. In these operations, the plane of the quadrant must always pass through the two objects, the distance of which is to be observed; and for this purpose it must be placed in various positions, according to the situation of the objects, which will soon be rendered easy by practice.

The observation being made, some person, at the very instant that the operator calls, must observe by the watch the exact hour, minute, and quarter minute, if there be no second hand, in order to find the apparent time; and at the same instant, or as quickly as possible, two assistants must take the altitudes of those objects the distance of which is observed; after which the observations necessary for finding the longitude are completed.

The Ephemeris shows the moon's distance from the sun, and likewise from proper stars, to every three hours of apparent time for the meridian of Greenwich; and, that the greater number of opportunities of observing this luminary may be given, her distance is generally set down from at least one object on each side of her. Her distance from the sun is set down whilst it is between 40 and 120 degrees; so that, by means of a sextant, it may be observed for two or three days after her first and before her last quarter. When the moon is between 40 and 90 degrees from the sun, her distance is set down both from the sun and from a star on the contrary side; and, lastly, when the distance is above 120 degrees, the distance is set down from two stars, one on each side of her. The distance of the moon from objects on the east side of her is found in the Ephemeris in the eighth and ninth pages of the month; and her distance from objects on the west is found in the tenth and eleventh pages of the month.

When the Ephemeris is used, the distance of the moon must only be observed from those stars the distance of which is set down there; and these afford a ready means of knowing the star from which her distance ought to be observed. The observer has then nothing more to do than to set his index to the distance roughly computed at the apparent time, estimated nearly for the meridian at Greenwich; after which he is to look to the east or west of the moon, according as the distance of the star is found in the eighth or ninth, or in the tenth or eleventh pages of the month; and having found the moon upon the horizon-glass, the star will easily be found by sweeping with the quadrant to the right or left, provided the air be clear and the star be in the line of the moon's shortest axis produced. The time at Greenwich is estimated by turning into time the supposed longitude from that place, and adding it to the apparent time at the ship, or subtracting it, as occasion requires. The distance of the moon from the sun or a star is roughly found at this time, by saying, As 180 minutes (the number contained in three hours) is to the difference in minutes between this nearly estimated time and the next preceding time set down in the Ephemeris, so is the difference in minutes between the distance in the Ephemeris for the next preceding and next following times to a number of minutes, which being added to the next preceding distance, or subtracted from it, according as it is increasing or decreasing, will give the distance nearly at the time when the observation is to be made, and to which the index must be set.

An easier method of finding the angular distance is by bringing the objects nearly into contact in the common way, and then fixing the index tight to a certain degree and minute, waiting until the objects are nearly in contact, giving notice to the assistants to get ready with the altitudes, and when the objects are exactly in contact, to call for the altitudes and the exact time by the watch. The observer may then prepare for taking another distance, by setting his index three or four minutes backwards or forwards, as the objects happen to be receding from or approaching to each other, and then proceeding to take the distance, altitudes, and time by the watch, as before. Thus the observer may take as many distances as he thinks proper; but four at the distance of three minutes, or three at the distance of four minutes, will at all times be sufficient. Thus not only the eye of the observer will be less fatigued, but he will likewise be enabled to manage his instrument with much greater facility in every direction, a vertical one only excepted. If, in taking the distances, the middle one can be taken at any even division on the arch, such as a degree, or a degree and twenty or forty minutes, that distance will be independent of the nonius division, and consequently free from those errors which frequently arise from the inequality of that division in several parts of the graduated arch. The observation ought always to be made about two hours before or after noon; and the true time may be found by the altitude of the sun taken at the precise time of the distance. If three distances are taken, then find the time by the altitude corresponding with the middle distance; and thus the observation will be secured from any error arising from the irregularity of the going of the watch. As the time, however, found by the altitude of a star cannot be depended upon, because of the uncertainty of the horizon in the night, the best way of determining the time for a night observation will be by two altitudes of the sun; one taken on the preceding afternoon, before he is within six degrees of the horizon, and the other on the next morning, when he is more than six degrees high. It must be observed, however, that in order to follow these directions, it is necessary that the atmosphere should be pretty free from clouds, otherwise the observer must take the observations at such times as he can best obtain them.

2. *To reduce the observed distance of the sun or a star from the moon to the true distance.*—1. Turn the longitude into time, and add it to the time at the ship if the longitude be west, but subtract it if it be east, which will give the supposed time at Greenwich. This we may call *reduced time.* 2. Find the nearest noon or midnight both before and after the reduced time in the seventh page of the month in the Ephemeris. 3. Take out the moon's semidiameter and horizontal parallaxes corresponding to these noons and midnights, and find their differences. Then say, as twelve hours is to the moon's semidiameter in twelve hours, so is the reduced time to a number of seconds, which, either added to or subtracted from the moon's semidiameter at the noon or midnight just mentioned, according as it is increasing or decreasing, will give her apparent semidiameter; to which add the correction of the Ephemeris, and the sum will be her true semidiameter at the reduced time. And as twelve hours is to the difference of the moon's horizontal parallax in twelve hours, so is the reduced time to a fourth number, which being added to or subtracted from the moon's horizontal parallax at the noon or midnight before the reduced time, according as it is increasing or decreasing, the sum or difference will be the moon's horizontal parallax at the reduced time. 4. If the reduced time be nearly any even part of twelve hours, viz. one sixth, one fourth, &c. these parts of the difference may be taken, and either added or subtracted according to the directions already given, without being at the trouble of working by the rule of proportion. 5. To the observed altitude of the sun's lower limb add the difference between the semidiameter and dip, and that sum will be his apparent altitude. 6. From the sun's refraction take his parallax in altitude, and the remainder will be the correction of the sun's altitude. 7. From the star's observed altitude take the dip of the horizon, and the remainder will be the apparent altitude. 8. The refraction of a star will be the correction of its altitude. 9. Take the difference between the moon's semidiameter and dip, and add it to the observed altitude if her lower limb was taken, or subtract it if her upper limb was taken, and the sum or difference will be the apparent altitude of her centre. 10. From the proportional logarithm of the moon's horizontal parallax, obtained from the Nautical Almanac (increasing its index by 10), taking the logarithmic cosine of the moon's apparent altitude, the remainder will be the proportional logarithm of her parallax in altitude; from which take her refraction, and the remainder will be the correction of the moon's altitude. 11. To the observed distance of the moon from a star add her semidiameter if the nearest limb be taken, but subtract it if the farthest limb be taken, and the sum or difference will be the apparent distance. 12. To the observed distance of the sun and moon add both their semidiameters, and the sum will be the apparent distance of their centres.

3. *To find the true distance of the objects, having their apparent altitudes and distances.*—1. To the proportional logarithm of the correction of the sun or star's altitude, add the logarithmic cosine of the sun or star's apparent altitude, the logarithmic sine of the apparent distance of the moon from the sun or star, and the logarithmic cosecant of the moon's apparent altitude. The sum of these, rejecting thirty from the index, will be the proportional logarithm of the first angle. 2. To the proportional logarithm of the correction of the sun or star's altitude, add the logarithmic cotangent of the sun or star's apparent altitude, and the logarithmic tangent of the apparent distance of the moon from the sun or star. The sum of these, rejecting twenty in the index, will be the proportional logarithm of the second angle. 3. Take the difference between the first and second angles, adding it to the apparent distance if it be less than ninety, and the first angle be greater than the second; but subtracting it if the second be greater than the first. If the distance be greater than ninety, the sum of the angles must be added to the apparent distance, which will give the distance corrected for the refraction of the sun or star. 4. To the proportional logarithm of the correction of the moon's altitude, add the logarithmic cosine of her apparent altitude, the logarithmic sine of the distance corrected for the sun or star's refraction, and the logarithmic cosecant of the sun's or star's apparent altitude. The sum, rejecting thirty in the index, will be the proportional logarithm of the third angle. 5. To the proportional logarithm of the correction of the moon's apparent altitude, add the logarithmic cotangent of her apparent altitude, and the tangent of the distance corrected for the sun or star's refraction; their sum, rejecting twenty in the index, will be the proportional logarithm of the fourth angle. 6. Take the difference between the third and fourth angles, and subtract it from the distance corrected for the sun or star's refraction if less than ninety and the third angle be greater than the fourth, or add it to the distance if the fourth angle be greater than the third; but if the distance be more than ninety, the sum of the angles must be sub-

tracted from it, to give the distance corrected for the sun or star's refraction, and the principal effects of the moon's parallax. 7. In the Ephemeris, look for the distance corrected for the sun and star's refraction, and the moon's parallax in the top column, and the correction of her altitude in the left-hand-side column; take out the number of seconds that stand under the former, and opposite to the latter. Look again in the same table for the corrected distance in the top column, and the principal effects of the moon's parallax in the left-hand-side column, and take out the number of seconds. The difference between these two numbers must be added to the corrected distance if less than ninety, but subtracted from it if it be greater; and the sum or difference will be the true distance.

4. *To determine the longitude after having obtained the true distance.*—Look in the Ephemeris amongst the distances of the objects for the computed distance between the moon and the other object observed on the given day. If it be found there, the time at Greenwich will be at the top of the column; but if it falls between two distances in the Ephemeris which stand immediately before and after it, and also the difference between the distance standing before and the computed distance, then take the proportional logarithms of the first and second differences, and the difference between these two logarithms will be the proportional logarithm of a number of hours, minutes, and seconds; which being added to the time standing over the first distance, will give the true time at Greenwich. Or it may be found by saying, As the first difference is to three hours, so is the second difference to a proportional part of time, which being added as above directed, will give the time at Greenwich. The difference between Greenwich time and that at the ship, turned into longitude, will be that at the time the observations were made; and will be east if the time at the ship is greatest, but west if it is least.

Having given these general directions, we shall next proceed to show some particular examples of finding the longitude at sea by all the different methods in which it is usually tried.

1. *To find the longitude by computation from the ship's course.*—Were it possible to keep an accurate account of the distance the ship has run, and to measure it exactly by the log or by any other means, then both latitude and longitude would easily be found by settling the ship's account to that time. For the course and distance being known, the difference of latitude and departure is readily found by the Traverse Table; and the difference of longitude being known, the true longitude and latitude would also be known. A variety of causes, however, concur to render this computation inaccurate, particularly the ship's continual deflection from the course set, by her playing to the right and left round her centre of gravity; the unequal care of those at the helm; and the distance supposed to be sailed being erroneous, on account of stormy seas, unsteady winds, currents, &c. for which it seems impossible to make any due allowance. The place of the ship, however, is judged of by finding the latitude every day, if possible, by observations; and if the latitude found by observation agrees with that by the reckoning, it is presumed that the ship's place is properly determined; but if they disagree, it is concluded that the account of the longitude stands in need of correction, as the latitude by observation is always to be depended upon.

Currents very often occasion errors in the computation of a ship's place. The causes of these in the great depths of the ocean are not well known, though many of the motions near the shore can be accounted for. It is supposed that some of those in the great oceans are owing to the tide following the moon, and a certain libration of the waters arising therefrom; and likewise that the unsettled nature of these currents may be owing to the changes in the moon's declination. In the torrid zone, however, a considerable current is occasioned by the trade winds, the motion being constantly to the west, at the rate of about eight or ten miles per day. At the extremities of the trade winds, or near the thirtieth degree of north or south latitude, the currents are probably compounded of this motion to the westward, and of one towards the equator; and hence all ships sailing within these limits ought to allow a course each day for the current.

When the error is supposed to have been occasioned by a current, it ought if possible to be tried whether the case is so or not; or we must make a reasonable estimate of its drift and course. Then with the setting and drift, as a course and distance, find the difference of latitude and departure; with which the dead reckoning is to be increased or diminished; and if the latitude thus corrected agrees with that by observation, the departure thus corrected may be safely taken as true, and thus the ship's place with regard to the longitude determined.

Example. Suppose a ship in twenty-four hours finds, by her dead reckoning, that she has made ninety-six miles of difference of latitude north, and thirty-eight miles of departure west; but by observation finds her difference of latitude 112, and on trial that there is a current which in twenty-four hours makes a difference of sixteen miles latitude north, and ten miles of departure east: Required the ship's departure.

	Miles.		Miles.
Diff. lat. by account	96 N.	Departure by account	38 W.
Diff. lat. by current	16 N.	Departure by current	10
True diff. lat.........	112		28 W.

Here the dead reckoning corrected by the current gives the difference of latitude 112 miles, which is the same as that found by observation; and hence the departure twenty-eight is taken as the true one.

When the error is supposed to arise from the courses and distances, we must observe, that if the difference of latitude is much more than the departure, or the direct course has been within three points of the meridian, the error is most probably in the distance. But if the departure be much greater than the difference of latitude, or the direct course be within three points of the parallel, or more than five points from the meridian, the error is probably to be ascribed to the course. But if the courses in general are near the middle of the quadrant, the error may be either in the course, or in the distance, or both. This method admits of three cases.

1. When, by the dead reckoning, the difference of latitude is more than once and a half the departure, or when the course is less than three points: Find the course to the difference of latitude and departure, and with this course and the meridional difference of latitude by observation, find the difference of longitude.

2. When the dead reckoning is more than once and a half the difference of latitude, or when the course is more than five points: Find the course and distance, with the difference of latitude by observation, and departure by account; then, with the co-middle latitude by observation, and departure by account, find the difference of longitude.

3. When the difference of latitude and departure by account is nearly equal, or the direct course is between three and five points of the meridian: Find the course with the difference of latitude and departure by account since the last observation. With this course and the difference of latitude by observation find another departure. Take half the sum of these departures for the true one.

With the true departure and difference of latitude by observation find the true course; then with the true course and meridional difference of latitude find the difference of longitude.

2. *To find the longitude at sea by a variation-chart.*— Dr Halley having collected a great number of observations on the variation of the needle in many parts of the world, was enabled by that means to draw certain lines on Mercator's chart, showing the variation in all the places over which they passed in the year 1700, at which time he first published the chart; and hence the longitude of those places might be found by the chart, provided its latitude and variation were given. The rule is, draw a parallel of latitude on the chart, through the latitude found by observation; and the point where it cuts the curved line marked with the variation which had been observed will be the ship's place.

Example. A ship finds by observation the latitude to be 18° 20′ north, and the variation of the compass to be 4° west. Required the ship's place. Lay a ruler over 18° 20′ north, parallel to the equator; and the point where its edge cuts the curve of 4° west variation gives the ship's place, which will be found in about 27° 10′ west from London.

This method of finding the longitude, however, is attended with two inconveniences. 1. When the variation lines run east or west, or nearly so, it cannot be applied; though, as this happens only in certain parts of the world, a variation chart may be of great use for the rest. Even in those places indeed where the variation curves do run east or west, they may be of considerable use in correcting the latitude when meridian observations cannot be had, which frequently happens on the northern coasts of America, the Western Ocean, and about Newfoundland; for if the variation can be found exactly, the east and west curve answering to it will show the latitude. But, 2. The variation itself is subject to continual change, and a chart, though ever so perfect at first, must in time become totally useless; and hence the charts constructed by Dr Halley, though of great utility at the time of their publication, became at length almost entirely useless. A new one was published in 1746 by Messrs Mountaine and Dodson, which was so well received that in 1756 they again drew variation lines for that year, and published a third chart in the following year. They also presented to the Royal Society a curious paper concerning the variation of the magnetic needle, with a set of tables annexed containing the result of more than 50,000 observations, in six periodical reviews from the year 1700 to 1756 inclusive, adapted to every five degrees of latitude and longitude in the more frequented oceans; all of which were published in the Philosophical Transactions for 1757.

3. *To find the longitude by the sun's declination.*— Having made such observations on the sun as may enable us to find his declination at the place, take the difference between this computed declination and that shown at London by the Ephemeris; from which take also the daily difference of declination at that time; then say, as the daily difference of declination is to the above found difference, so is 360 degrees to the difference of longitude. In this method, however, a small error in the declination will make a great one in the longitude.

4. *To find the longitude by the moon's culminating.*— Seek in the Ephemeris for the time of her coming to the meridian on the given day and on the day following, and take their difference; also take the difference between the times of culminating on the same day as found in the Ephemeris and as observed; then say, as the daily difference in the Ephemeris is to the difference between the Ephemeris and observation, so is 360 degrees to the difference of longitude. In this method also a small difference in the culmination will occasion a great one in the longitude.

5. *By eclipses of the moon.*—This is done much in the same manner as by the eclipses of Jupiter's satellites; for if, in two or more distant places where an eclipse of the moon is visible, we carefully observe the times of the beginning and ending, the number of digits eclipsed, or the time when the shadow touches some remarkable spot, or when it leaves any particular spot on the moon, the difference of the times when the observations were made will give the difference of longitude. Phenomena of this kind, however, occur too seldom to be of much use.

6. In the 76th volume of the Philosophical Transactions, Mr Edward Pigot gives a very particular account of his method of determining the longitude and latitude of York; in which he also recommends the method of determining the longitude of places by observations of the *moon's transit over the meridian.* The instruments used in his observations were a gridiron pendulum clock, a two feet and a half reflector, an eighteen-inch quadrant made by Mr Bird, and a transit instrument made by Mr Sisson.

By these instruments an observation was made, on the 10th of September 1783, of the occultation of a star of the ninth magnitude by the moon, during an eclipse of that planet at York and Paris. Besides this, there were observations made of the immersions of φ *Aquarii* and δ *Piscium;* the result of all which was, that between Greenwich and York the difference of meridians was 4′ 27″.

In 1783, Mr Pigot informs us, that he thought of finding the difference of meridians by observing the meridian right ascensions of the moon's limb. This he thought had been quite original. But he found it afterwards in the Nautical Almanac for 1769, and in 1784 read a pamphlet on the same subject by the Abbé Toaldo; still he found that the great exactness of this method was not suspected, though he is convinced that it must soon be universally adopted in preference to that from the first satellite of Jupiter.

After giving a number of observations on the satellites of Jupiter, he concludes, that the exactness expected from observations, even on the first satellite, is much overrated. "Among the various objections," says he, "there is one I have often experienced, and which proceeds solely from the disposition of the eye, that of seeing more distinctly at one time than another. It may not be improper also to mention, that the observation I should have relied on as the best, that of 30th August 1785, marked *excellent,* is one of those most distant from the truth."

After giving a number of observations on the eclipse of the moon on the 10th of September 1783, our author concludes, that the eclipses of the moon's spots are in general too much neglected, and that it might be relied upon much more were the following circumstances attended to: 1. To be particular in specifying the clearness of the sky; 2. to choose such spots as are well defined, and leave no hesitation as to the part eclipsed; 3. every observer to employ, as far as possible, telescopes equally powerful, or at least to let the magnifying powers be the same. "A principal objection," says he, "may still be urged, viz. the difficulty of distinguishing the true shadow from the penumbra. Were this obviated, I believe the results would be more exact than from Jupiter's first satellite: undoubtedly the shadow appears better defined if magnified a little; but I am much inclined to think that, with high magnifying powers, there is greater certainty of choosing the same part of the shadow, which perhaps is more than a sufficient compensation for the loss of distinctness."

The following rule for meridian observations of the moon's limb is next laid down: "The increase of the moon's right ascension in twelve hours (or any given time found by computation), is to twelve hours as the increase of the moon's right ascension between two places found by observation is to the difference of meridians. We subjoin an example.

November 30, 1782.

h.	′	″		
13	12	57·62	Meridian transit of moon's second limb	By clock at Greenwich.
13	13	29·08	Ditto of α ♍	
		31·46	Difference of right ascension.	
13	14	8·05	Meridian transit of moon's second limb	By clock at York.
13	14	30·13	Ditto of α ♍	
		32·08	Difference at York	The clocks going nearly sidereal time, no correction is required.
		31·46	Difference at Greenwich	
		9·38	Increase of the moon's apparent right ascension between Greenwich and York, by observation.	

141″ in seconds of a degree, ditto, ditto, ditto.

The increase of the moon's right ascension for twelve hours, by computation, is 23,340 seconds; and twelve hours reduced into seconds is 43,200. Therefore, according to the rule stated above,

23,340″ : 43,200″ : diff. of merid. = 261″.

"These easy observations and short reduction," says Mr Pigot, "are the whole of the business. Instead of computing the moon's right ascension for twelve hours, I have constantly taken it from the Nautical Almanacs, which give it sufficiently exact, provided some attention be paid to the increase or decrease of the moon's motion. Were the following circumstances attended to, the results would be undoubtedly much more exact.

"1. Compare the observations with those which have been made in several other places. 2. Let several and the same stars be observed at these places. 3. Such stars as are nearest in right ascension and declination to the moon are infinitely preferable. 4. It cannot be too strongly urged, to get, as nearly as possible, an equal number of observations of each limb, to take a mean of each set, and then a mean of both means. This will in a great measure correct the error of telescopes and sight. 5. The adjustment of the telescopes to the eye of the observer before the observation is also very necessary, as the sight is subject to vary. 6. A principal error proceeds from the observation of the moon's limb, which may be considerably lessened, if certain little round spots near each limb were also observed in settled observatories; in which case the libration of the moon will perhaps be a consideration. 7. When the difference of meridians, or of the latitudes of places, is very considerable, the change of the moon's diameter becomes an equation.

"Though such are the requisites to use this method with advantage, only one or two of them have been employed in the observations that I have reduced. Two thirds of these observations had not even the same stars observed at Greenwich and York, and yet none of the results, except a doubtful one, differ 15″ from the mean; therefore I think we may expect a still greater exactness, perhaps within 10″, if the above particulars be attended to.

"When the same stars are not observed, it is necessary for the observers at both places to compute their right ascension from tables, in order to get the apparent right ascension of the moon's limb. Though this is not so satisfactory as by actual observation, still the difference will be trifling, provided the stars' right ascensions are accurately settled. I am also of opinion, that the same method can be put in practice by travellers with little trouble, and a transit instrument constructed so as to fix up with facility in any place. It is not necessary, perhaps, that the instrument should be perfectly in the meridian for a few seconds of time, provided stars, nearly in the same parallel of declination with the moon, are observed; nay, I am inclined to think, that if the instrument deviates even a quarter or half a degree, or more, sufficient exactness can be attained, as a table might be computed, showing the moon's parallax and motion for such deviation; which last may easily be found by the well-known method of observing stars whose difference of declination is considerable.

"As travellers very seldom meet with situations to observe stars near the pole, or find a proper object for determining the error of the line of collimation, I shall recommend the following method as original. Having computed the apparent right ascension of four, six, or more stars, which have nearly the same parallel of declination, observe half of them with the instrument inverted, and the other half when in its right position. If the difference of right ascensions between each set by observation agrees with the computation, there is no error; but if they disagree, half that disagreement is the error of the line of collimation. The same observations may also serve to determine whether the distances of the corresponding wires are equal. In case of necessity, each limb of the sun might be observed in the same manner, though probably with less precision. By a single trial I made above two years ago, the result was much more exact than I expected. Mayer's catalogue of stars will prove of great use to those that adopt the above method. I am rather surprised that the immersions of known stars of the sixth and seventh magnitude, behind the dark limb of the moon, are not constantly observed in fixed observatories, as they would frequently be of great use."

LONGITUDINAL, in general, denotes something placed lengthwise. Thus some of the fibres in the vessels of the human body are placed longitudinally, others transversely or across.

LONGOBARDI. See LOMBARDS.

LONGOMONTANUS, CHRISTIAN, a learned astronomer, born in a village of Denmark in 1562. He was the son of a ploughman, and during his studies had to suffer all the hardships to which his condition exposed him, dividing his time, like the philosopher Cleanthes, between the cultivation of the earth and the lessons he received from the minister of the place. At last, when he was fifteen, he stole away from his family, and went to the college at Wiburg, in which he spent eleven years; and though he was obliged to earn a livelihood, he applied himself to study with such ardour, that amongst other sciences he learned the mathematics in great perfection. He afterwards went to Copenhagen, where the professors of the university of that city soon conceived so high an opinion of him, that they recommended him to the celebrated Tycho Brahe. Longomontanus lived eight years with that celebrated astronomer, and was of great service to him in his observations and calculations. At length, being extremely desirous of obtaining a professor's chair in Denmark, Tycho Brahe consented, though with some reluctance, to deprive himself of his services; gave him a discharge filled with the highest testimonies of esteem; and furnished him with money for the expense of his journey. He obtained a professorship of mathematics in the university of Copenhagen in 1605, and discharged the duty of the office creditably until his death, which happened in 1647. He wrote many learned works, amused himself with endeavouring to square the circle, and pretended that he had actually discovered a mode of doing so; but Dr John Pell, an English mathematician, attacked him warmly on the subject, and proved that he was completely mistaken.

LONGTOWN, a town of Cumberland, on the Scotch borders, near the conflux of the Esk and Kirksop, nine miles from Carlisle, and 310 miles from London, It has a market on Thursday, and a charity school for the education of sixty children. The population amounted in 1831 to 2049.

LONGUS, a Greek sophist, author of a book entitled Ποιμενικα, or a romance containing the loves of Daphnis and Chloe. Huet, bishop of Avranches, speaks very favourably of this work; but he censures the obscene touches with which it is interspersed. None of the ancient authors mention Longus, so that the time when he lived cannot be fixed with certainty. There is an English translation of this author, which is ascribed to Mr Craggs, who was at one time secretary of state.

LONIGO, a city of Italy, the capital of a district in the Austrian delegation of Vicenza. It stands on the river Gua, and is well built and fortified. It is celebrated for a beautiful palace of the Rocca family, constructed by Palladio. It contains 5810 inhabitants, who carry on a brisk trade.

LONS LE SAUNIER, an arrondissement of the department of the Jura, in France, 712 square miles in extent. It is divided into eleven cantons, and subdivided into 298 communes, inhabited by 107,500 persons. The capital is the city of the same name. It is situated in a mountainous country, on the banks of the river Baille, and surrounded with picturesque but barren rocks, amongst which are some salt springs, and establishments for procuring refined salt. It contains 860 houses, and 6200 inhabitants. Long. 5. 30. E. Lat. 46. 36. N.

LONTAR PULO ISLE, an island in the Indian Ocean, separated from the peninsula of Malacca by a narrow strait. This and some of the neighbouring islands are inhabited by men whose whole pursuits are on the sea, that being the element from which they derive their whole subsistence. Agriculture is wholly unknown to them, and they are of simple and inoffensive manners.

LOOE, EAST, a borough and market-town of Cornwall, in the hundred of West, 233 miles from London. It is situated on the river of the same name, which runs into a creek on the shore. It has a market on Saturday. It returned two members to parliament, of which privilege, by the late law, it has been deprived. The population amounted in 1801 to 467, in 1811 to 608, in 1821 to 770, and in 1831 to 865.

LOOE, WEST, a borough and township in the parish of Talland, in Cornwall. It is opposite to East Looe, on the same river, with which it is connected by a bridge. It had formerly the privilege of returning two members to parliament, but of this it has been deprived by the reform act. It has a small but convenient harbour, defended by a battery. The population amounted in 1801 to 376, in 1811 to 433, in 1821 to 539, and in 1831 to 593.

LOO-CHOO ISLANDS, called LEWCHEW by Mr Macleod, and by others LIQUEO, or LIEOUKIOU. This group of islands is situated in the Eastern Ocean, to the south of Japan, about 400 or 500 miles east of the Chinese coast. They were little known to Europeans until they were visited by Captains Maxwell and Hall in the Alceste and Lyra in 1816, on their return from conveying Lord Amherst to China. Very full accounts have been published by Captain Hall and Mr Macleod of these islands, and of the climate and soil, as well as of the inhabitants, who appeared to these gentlemen to be extremely simple and interesting in their manners. These islands are in number thirty-six; but the only one of any great extent is the Great Loo-choo, which is thirty miles in length, and from twelve to fifteen in breadth. The climate is here a happy medium between the opposite extremes of heat and cold. Being situated in the middle of a vast ocean, these islands are refreshed by the sea breezes, which, blowing continually over them, produce an agreeable coolness. They are also well watered by small rivers and streamlets, which, rising in the central eminences, flow in different directions to the sea, and afford an abundant supply of excellent water. Being in the latitude of 26. N., the scenery, though not quite so rich, is, according to Captain Hall, even more pleasing to the eye than in countries nearer to the equator; the vegetation not being so luxuriant as to overload the landscape with foliage. The style of the landscape is on the whole decidedly tropical, though there is much variety; and the groves of pine trees give some parts of the country quite a European character. The orange and lime, the banyan of India, and the Norwegian fir, all thrive in Loo-choo. The mode of dressing the ground at Loo-choo is very neat, and resembles that of China, particularly in the process of manuring and irrigation. Tobacco, wheat, rice, Indian corn, millet, sweet potatoes, brinjals, and many other tropical vegetables, grow in great perfection at Loo-choo. Along the sides of the hills, and around the villages, the bamboo and rattan grow to a considerable size. But Captain Hall mentions that the pine was the most conspicuous tree which they observed on the island, rising to a great height and size. Some are forty feet in height, and three or four in girth. The cattle on this island are of a small black breed, and invariably used instead of horses for agricultural purposes. Hogs, goats, and poultry, with rice and a great variety of vegetables, form the chief food of the inhabitants, milk being seldom used. The English saw no geese on the island, nor sheep; but their horses, though very small and slender, were sufficiently strong for the natives. Their goats and pigs were also diminutive; but the poultry were large and excellent. These islands are not infested by any wild animals. They had no carts or wheeled carriages of any kind, all loads being carried by horses; and the roads, which are numerous, and generally kept in excellent order, measure generally from six to ten feet across.

The whole coast of Loo-choo, as well as of the other islands, is encircled with coral reefs, which do not appear above water; and when the weather is calm, and their situation is not pointed out by breakers, they are exceedingly dangerous to mariners. The Alceste, Captain Maxwell's ship, was several times in danger from these hidden rocks. This singular formation, which appears to be extending itself over the Pacific, was minutely examined by Captain Hall. After the sea has left it for some time, it becomes dry, and appears to be a compact rock; but no sooner does the tide rise again, and the waves begin to wash over it, than millions of coral worms, protruding themselves from holes in the surface, begin their operations; so that, from their prodigious numbers, the whole surface of the rock appears to be alive and in motion. These insects or worms cannot raise the rock above the surface of the water, and the level of the highest tide is accordingly the limit of the rock upwards, after which a horizontal field comes to be formed coincident with that plane, and perpendicular on all sides; and thus the reef, extending itself perpendicularly, and in all directions, becomes extremely dangerous to navigators. On the coast of Loo-choo there are several excellent harbours, particularly one, which is capacious and safe, and affords everywhere depth of water for the largest ships, with secure anchorage. Its banks consist of high rocks, overgrown with climbing plants and flowers.

These islands are inhabited by a singular and apparently amiable people. They are of a diminutive stature, not exceeding in their average height above five feet two inches. But they are strong, well-made, and athletic; and in complexion they are quite as fair as the natives of Spain and Portugal. They invariably manifested towards their English visitors the most gentle, polite, and humane dispositions, but with that jealousy of them as strangers which is peculiar to China, Japan, and all the neighbouring countries. They were at first extremely averse to the landing of their visitors, and it was only after long deliberations that they were induced to concede the liberty of doing so. But our people were confined to a small space on the sea-shore, under a burning sun; and it was only by renewed entreaties that they were allowed to extend their walks into the country. The natives, however, very freely visited the English ships, and examined them carefully in all their equipments and detail. They accepted readily the hospitality of the strangers, and conformed to their manners in every thing. In their interviews they always showed a natural good breeding, bowing whenever they spoke to the English, uncovering their heads in their presence, and, in drinking, bowing to all around. After they had permitted the English to land, many visits were paid; but they never admitted the strangers into the interior of their town, and even limited their walks within a certain space. Any attempt to pass these bounds was always resisted by the sentinels; not, however, by force, but by a polite request, and by representing, that if the orders of the court were transgressed, blame would fall upon them. Some overtures were made by Captain Maxwell for an interview with the king; but these were always steadily resisted, on the ground or pretence that no embassy or letters were brought from the king of England, to whom, however, the king of Loo-choo wrote a letter, which was unfortunately lost in the wreck of the Alceste. It was extremely difficult to bring about any intercourse with this people. Ordinary requests were made the subject of tedious negociations; and the most ungracious feature in their character was their uniform aversion to any intimate communication with their visitors. In one particular they manifested a rigid adherence to Chinese manners; namely, in carefully withholding from the view of the Europeans their women, though the latter did not appear otherwise to be very closely confined. The practice of polygamy, which prevails in China, has no place here, and, the English were told, was even held in abhorrence. From the free intercourse also of the different sexes, the parties had opportunities of being acquainted before marriage.

One of the most remarkable facts mentioned by Captain Hall is, that the natives of these islands were unacquainted with the use of fire-arms. From all that the English could observe, they were even ignorant of the use of money; and though those amongst the natives who had visited China must have seen the currency of that country, yet none of them showed any desire to possess Spanish dollars or gold coins, nor could it ever be learned whether they were in possession of any common medium of exchange. With regard to their want of arms, it is supposed by Mr Macleod, that the Chinese, after conquering, had disarmed them. The musketry and cannon of the English were objects of great wonder to them; and when they saw Captain Maxwell bring down a bird on the wing, they were shocked and terrified, and requested that fire-arms should not be again brought into the island. When Napoleon was informed, at St Helena, that these people had neither arms nor money, he ridiculed the idea as incredible and absurd, and affirmed that the English had been imposed on. The result justified his penetration. These people are well acquainted with both; and it is now known that, notwithstanding all their fair seeming, they are about the most remorseless pirates in the Yellow Sea. In their intercourse with our people, however, they were remarked for their honesty; insomuch, that though they were freely admitted on board of the English ships, and many valuable articles were often in their way, yet nothing was ever missed.

They appear to live on social and friendly terms with one another, and have frequently pic-nic parties in the fields, the dinner being carried about in little japanned boxes, with sliding drawers, fastened to the end of a bamboo. They entertained the English at dinner; and the meal consisted of hard-boiled eggs coloured and sliced, fish dried in butter, sliced junk smoked, sliced pig's liver; then came tea, which was succeeded by an unpalatable dish of coarse, soft, black sugar, wrapped up in unbaked dough. Cakes in various shapes, with something like cheese, completed the entertainment; the intervals being filled up with drinking sackee, and with smoking.

The Loo-chooans appear to have made no progress in science or literature, though several individuals amongst them were distinguished by the English for their intelligence, and turn for inquiry. Their language is a dialect of the Japanese; but they have Chinese books, which are studied by the learned. Their religion seems to resemble the superstition of China; but it is remarkable that the order of priests, who are generally objects of veneration in all countries, are here considered as an inferior caste. All the science of these islanders is derived from the Chinese. Their practice of medicine is also Chinese; and they generally administer to their patients roots, seeds, and dried flowers of the country. The capital of Great Loo-choo, and of the archipelago, is situated five miles from its port of Napakiang. The English were not allowed to approach it, but saw it from a distance, beautifully situated on the top of a hill; the houses, intermingled with the trees, rising above one another, and the royal palace above the whole. When the English left these islands, the natives professed the most affectionate regard for them, and expressed (with what sincerity the reader may judge) the deepest regret at their departure. Long. of the capital of the Great Loo-choo, 127. 52. 1. E. Lat. 26. 14. N.

LOOF, the after-part of a ship's bow, or that part of her side forward where the planks begin to be incurvated into an arch as they approach the stem.

LOOK-OUT, in nautical language, a watchful attention to some important object or event which is expected to arise from the actual situation of a ship with reference to other objects. It is principally used in navigation when there is a probability of danger from the real or supposed proximity of land, rocks, or enemies; in short, whatever peril she may encounter through inattention, but which might be avoided by a prudent and necessary vigilance.

LOOKIANG, a river in the Burman dominions, formerly supposed to be a tributary of the Irrawuddy, with which it has no connection. It is called Thaluayn in the Ava territories, and falls into the sea at Martaban.

LOOKING-GLASSES are plain mirrors of glass, which, being impervious to the light, reflect the images of things placed before them. See MIRROR and OPTICS.

LOOL, in *Metallurgy*, a vessel prepared to receive the washings of ores of metals. The heavier or more metallic parts of the ores remain in the trough in which they are washed; the lighter and more earthy run off with the water, but settle in the lool.

LOOM, the weaver's frame, a machine by which many distinct threads are woven into one piece. Looms are of various structures, accommodated to the various kinds of materials to be woven, and the various modes of weaving them, namely, for woollens, silks, linens, cottons, cloths of gold, and other works, as tapestry, ribands, stockings, and other articles, each of which will be found under its proper head. The weaver's loom-engine, otherwise called the

Dutch loom-engine, was brought from Holland to London about the year 1676.

Loom, at sea. If a ship appears big when at a distance, they say she looms, or appears a great sail. The term is also used to denote the indistinct appearance of any other distant objects.

LOONGHEE, a town of the Burman empire, situated on the east side of the Irrawuddy. Long. 19. 55. E. Lat. 19. 41. N.

LOOP, in the iron-works, is a part of a sow or block of cast iron broken or melted off from the rest, and prepared for the forge or hammer. The usual method is, to break off the loop of about three quarters of a hundredweight. This loop is taken up with slinging-tongs, and beaten with iron sledges till it be brought to a square mass of about two feet long, which is called a bloom.

LOP, a lake of Central Asia, situated upon the western side of the great desert of Shamo or Cobi, which lies between it and China. It has on its banks a city of the same name, on the great caravan road from Cashgar to China, of which the present state is not accurately known. According to Marco Polo, the caravans usually stop here, and prepare for crossing the formidable desert which lies before them.

LOPEZ de Vega. See Vega.

LORARII, amongst the Romans, officers whose business it was, with whips and scourges, to compel the gladiators to engage. The *lorarii* also punished slaves who disobeyed their masters.

LORCA, a city of Spain, in the province of Murcia. It is situated on a small river called the Sangonera, which is frequently dry. The soil is excellent for producing wheat, barley, olives, and fruits, but frequently fails from want of water, an evil which was attempted to be remedied by the construction of dykes in order to retain the streams when they are abundant; but, in 1803, these banks were burst by an unusual weight of water, the lands below were temporarily inundated, and since then they have at times felt the great evil of want of water. The city has nine parish churches, ten monasteries, 21,866 inhabitants, fourteen saltpetre houses, with a house for preparing soda; and it carries on a great deal of trade through the harbour of Aguilas, which is eleven and a half miles distant from it.

LORD, a title of honour, given to those who are noble either by birth or by creation. The title is also by courtesy given to all the sons of dukes and marquises, and to the eldest sons of earls; and it is likewise a title of honour bestowed on those who are honourable by their employment, as Lord Advocate, Lord Chamberlain, Lord Chancellor, and the like. The word is Saxon, but abbreviated from two syllables into one; for it was originally *Hlaford,* which by dropping the aspiration became *Laford,* and afterwards by contraction *Lord.* "The etymology of the word," says Coates, "is well worth observing; for it was composed of *hlaf,* a loaf of bread, and *ford,* to give or afford; so that *Hlaford,* now *Lord,* implies a giver of bread, because, in those ages, such great men kept extraordinary houses, and fed all the poor; for which reason they were called *givers of bread,* a thing now much out of date, great men being much fonder of retaining the title than of observing the practice for which it was first given."

Lords, House of, one of the three estates of parliament, and composed of the Lords Spiritual and Temporal.

1. The *Spiritual Lords* consist of the archbishops and bishops. Though these lords are in the eye of the law a distinct estate from the lords temporal, and are so distinguished in our acts of parliament, yet in practice they are usually blended together under the name of The Lords; they intermix in their votes, and the majority of such intermixture joins both estates. From the want of a separate assembly, and a separate negative on the part of the prelates, some writers have argued very cogently, that the lords spiritual and temporal are now in reality only one estate; and this is unquestionably true in every effectual sense, though the ancient distinction between them still nominally continues. For if a bill should pass their house, there is no doubt of its validity, though every lord spiritual should vote against it (of which Selden and Sir Edward Coke give many instances); as, on the other hand, it would doubtless be equally good if the lords temporal present were inferior to the bishops in number, and every one of those temporal lords gave his vote to reject the bill, though Sir Edward Coke seems to doubt as to this.

2. The *Temporal Lords* consist of all the peers of the realm (the bishops not being in strictness held to be such, but merely lords of parliament), by whatever title of nobility distinguished; dukes, marquises, earls, viscounts, and barons. Some of these sit by descent, as do all ancient peers; others by creation, as do all new-made ones; others, since the union with Scotland and Ireland, by election. The Lords have a right to be, and constantly are, attended by the judges of the courts of King's Bench and Common Pleas, and such of the Barons of the Exchequer as are of the degree of the coif, or have been made serjeants at law; as likewise by the king's learned counsel, being serjeants, and by the masters of the court of Chancery, for their advice in point of law, and for the greater dignity of their proceedings. The secretaries of state, with the attorney and solicitor general, also used to attend the House of Peers, and have to this day their regular writs of summons issued out at the beginning of every parliament, *ad tractandum et consilium impendendum,* though not *ad consentiendum;* but whenever they have been members of the House of Commons, their attendance here has, for a long period, been dispensed with. Another privilege is, that every peer, by license obtained from the king, may make another lord of parliament his proxy, to vote for him in his absence; a privilege which a member of the other house can by no means exercise, as he is himself but a proxy for a multitude of other people. Each peer has also a right, by leave of the house, when a vote passes contrary to his sentiments, to enter his dissent upon the journals of the house, with the reasons for such dissent, which is usually styled his protest. All bills likewise, which may in their consequences affect in any way the rights of the peerage, are by the custom of parliament to have their first rise and beginning in the House of Peers, and to suffer no changes or amendments in the House of Commons.

LORD Howe's Group, a cluster of islands in the Pacific Ocean, discovered by Captain Hunter in 1791. Of these, thirty-two were counted from the mast-head. They are situated in about long. 159. 24. E. and lat. 5. 30. S.

LORDOSIS (of λορδος, *bent inwards*), in medical writings, a name given to a distempered state of the spine, in which it is bent inwards, or towards the anterior parts. It is used in opposition to *gibbous,* or *hump-backed.*

LORETTO, a city of the delegation of Macerata, in the papal dominions, in Italy. It is situated at the spot where the river Musone falls into the sea. It is surrounded with walls and ditches, has a cathedral, and several other churches, and contains about 8000 inhabitants. It is remarkable for the *Santa Casa,* or sacred house, which is affirmed to have been miraculously brought to this place in 1294, and over which a large church has been constructed in order to preserve it. It is an object of veneration with many Catholics, and is visited by great numbers of pilgrims. The subsistence of the people mainly depends on this object, and in making rosaries, crucifixes, medallions, and other articles for the gratification of pious visitors. Its wealth was dissipated during the French revolution, but it has since accumulated treasures, though not with the rapidity of former times. Long. 13. 29. 45. E. Lat. 43. 27. N.

Loretto, a town of the kingdom of Naples, in the province of Abbruzzo Citeriore, containing 3500 inhabitants.

LORGUES, a city of France, in the department of the Var, and arrondissement of Draguignan. It contains 5000 inhabitants, who employ twelve mills in crushing olives, and produce a very large quantity of the best oil. Long. 6. 31. E. Lat. 43. 29. N.

LORICA, a cuirass, brigantine, or coat of mail, in use amongst the Roman soldiers. It was generally made of leather, and its name is supposed to be derived from *lorum.* The *loricæ* were set with plates of metal in various forms; sometimes in books or rings like a chain, sometimes like feathers, and sometimes like the scales of serpents or fishes, to which plates of gold were frequently added. There were other lighter cuirasses, consisting only of numerous folds of linen cloth, or of flax, made strong enough to resist weapons. Such soldiers as were rated under a thousand drachms, instead of the *lorica* now described, wore a *pectorale.* The Roman *lorica* was made like a shirt, and defended the wearer both before and behind, but was so contrived that the back part could be occasionally separated from the front. Some of the *loricæ* were made of cords of hemp or flax, close set together; and hence they are called *thoraces, bilices, trilices,* and so on, from the number of the cords fixed one upon another; but these were used rather in hunting than in the field of battle.

LORIOL, a town of France, in the department of the Drome, and arrondissement of Valence, situated on the river Drome, over which is an extraordinary bridge, with an arch in the centre of eighty-four feet in span. It contains 390 houses, and 2460 inhabitants.

LORNE, a division of Argyleshire, in Scotland, which gives the title of marquis to the Duke of Argyll. See ARGYLESHIRE.

LORRAINE. See FRANCE.

LOSTWITHIEL, a borough and market town of the county of Cornwall, in the hundred of Powder, 246 miles from London. It stands on the river Fowey, but the harbour is nearly choked up. A stannary court is held here, and a market on Saturday. It formerly returned two members to parliament, chosen by the corporation, but it has been deprived of that privilege by the reform law. Near to it is the fine seat of Bocconnoc, belonging formerly to Lord Camelford, now to Lord Grenville. The population amounted in 1801 to 743, in 1811 to 825, in 1821 to 933, and in 1831 to 1548.

LOT, a department of France, formed out of the division of Quercy, in the ancient government of Guienne. It extends in north latitude from 44. 14. to 45. 2. and in east longitude from 0. 52. to 2. 2., being in extent 2156 square miles, or 398,406 hectares. It is bounded on the north by the department of the Corrèze, on the east by Cantal and Aveyron, on the south by Tarn-Garonne, and on the west by Lot-Garonne and Dordogne. It comprises three arrondissements, twenty-nine cantons, and 345 communes, and is peopled by 263,500 persons. It is an undulating district, with hills of moderate height, having between them valleys of great fertility. The soil is generally dry and somewhat rocky, but is covered with a coat of mould, deepest in the valleys, which produces excellent corn, so that the surplus of grain is greater than in any other of the departments of France. The several fruits, especially plums, chestnuts, and walnuts, are raised in great abundance; but the chief fruit is the grape, which is grown extensively on the hills. The wine has great reputation, both from being uninjured by transportation, and by keeping good for a long time. The best grows in the arrondissement of Cahors, whence about 60,000 pipes are sent, some of them to Bordeaux. Much brandy also is made, as well as vinegar, and both enjoy great reputation. The agriculture is well conducted, and, besides corn, affords good crops of pulse, hemp, flax, and saffron. The breed of black cattle is very good, and the flocks of sheep are numerous; the quality of the wool having been much improved of late years by crossing their own with Merinos from Spain. The only mines are some few of iron; but the quarries yield mill-stones, alabaster, marble, limestone, and fullers' earth, in great abundance. The manufactures are inconsiderable, consisting of woollen and linen cloth, some hardware, paper, and leather. The department elects three deputies to the legislative body. The capital is the city of Cahors.

LOT AND GARONNE, a department of France, formed out of those parts of the ancient government of Guienne denominated Condomois and Agenois. It extends in north latitude from 43. 58. to 44. 45. and in longitude from 0. 21. east, to 0. 49. west, containing 2249 square miles, or 532,640 hectares, of which 306,720 are under the plough, 65,320 are vineyards, 59,640 are woods and forests, 32,726 are meadows, 52,704 are uncultivated, 6816 are marshes, and the remainder are the courses of rivers and the sites of towns and villages. It is bounded on the north by the departments of the Gironde and of the Dordogne, on the east by those of the Lot and the Tarn-Garonne, on the south by Gers, and on the west by the Gironde. It is divided into four arrondissements, twenty-nine cantons, and 435 communes, and contains 326,850 inhabitants, of whom about 30,000 are Protestants, and the remainder adhere to the Roman Catholic church. It is a lofty plain, intersected with deep valleys, the hills bounding which are covered with vines, whilst the bottoms have streams bordered by fertile meadows. The two chief rivers, the Lot and the Garonne, are navigable for barges the whole length of the department, and receive the waters of numerous tributary streams. The soil is generally fertile, and though, from attachment to old and slovenly customs, agriculture is ill conducted, as much corn is produced as enables one fourth of the crops to be disposed of to the neighbouring departments. The land is chiefly occupied by small farmers, who pay their rent by delivering half the crops to the owner. Besides corn, much hemp of excellent quality is raised, and also some flax. A vast quantity of fruit is produced. The wine is generally of a medium quality; but some of great estimation is made in Thezac, Perigord, Lavocal, and Clairac. The forests, besides fire and building wood, yield tar, turpentine, and pitch, and considerable quantities of cork. A great number of bees are kept, which make much honey and wax; and it is said that two millions of geese are maintained. The only mines are those of iron, which furnish yearly about 1400 tons, the greater part of which is manufactured for home consumption into various kinds of hardware. There are some manufactures of sailcloth and other linens, and of woollens, leather, glass, paper, and snuff from tobacco grown in several parts. One of the most extensive employments is that of cork-cutting, which is said to supply more than thirty millions of corks. The members chosen for the legislative body are three. The capital is the city of Agen.

LOTHIAN, a name given to three counties of Scotland, Haddingtonshire, Edinburghshire, and Linlithgowshire; otherwise called *East, Mid,* and *West* Lothians. See the articles on these different shires.

LOTION is, strictly speaking, such washing as concerns beautifying the skin, by cleansing it of those deformities which are thrown out upon it by distempered blood.

LOTION, in *Pharmacy,* denotes a preparation of medicines, by washing them in some liquid, either made very light, so as to take away only the dregs, or sharp, so as to penetrate them, in order to clear them of some salt or corrosive spirit, as is done to antimony, precipitates, magisteries, and the like, or intended to take away some foulness or ill quality, and communicate some good one.

LOTOPHAGI, in *Ancient Geography,* a people of the

Regio Syrtica (so called from their living upon the lotus), inhabiting the country between the two Syrtes, from the Cinyphus to the Triton. The lotus was said to be so luscious a food as to make strangers forget their native country.

LOTTERY, a kind of public game at hazard, in order to raise money for the service of the state, being with us appointed by the authority of parliament, and managed by commissioners appointed by the Lords of the Treasury for that purpose. It consists of several numbers of blanks and prizes, which are drawn out of wheels, one of which contains the numbers, and the other the corresponding blanks or prizes.

The Romans invented lotteries in order to enliven their Saturnalia. This festival began by the distribution of tickets which gained some prize. Augustus made lotteries which consisted of things of little value; but Nero established some for the people, in which a thousand tickets were distributed daily, and several of those who were favoured by fortune got rich by means of them. Heliogabalus invented some very singular ones, in which the prizes were either of great value or of none at all; one gained a prize of six slaves, and another of six flies; some got valuable vases, and others vessels of common earth.

The first English lottery which we find mentioned in history was drawn in the year 1569. It consisted of 40,000 lots, at 10s. each lot. The prizes were plate; and the profits were to go towards repairing the havens of the kingdom. It was drawn at the west door of St Paul's cathedral. The drawing began on the 11th of January 1569, and continued incessantly, day and night, until the 6th day of May following. (Maitland, vol. i. p. 257.) There were then only three lottery-offices in London. The proposals for this lottery were published in the years 1567 and 1568. It was at first intended to have been drawn at the house of Mr Dericke, her majesty's jeweller; but it was afterwards drawn as above mentioned.

In 1748, Dr Rawlinson showed the Antiquarian Society "A proposal for a very rich lottery-general without any blankes, contayning a great number of good prizes, as well of redy money as of plate and certain sorts of merchandizes, having been valued and prised by the commandment of the queene's most excellent majestie's order, to the intent that such commodities as may chance to arise thereof, after the charges borne, may be converted towards the reparations of the havens and strength of the realme, and towards such other public good workes." He then goes on to say, "The number of lotts shall be foure hundred thousand, and no more; and every lott shall be the summe of tenne shillings sterling, and no more. To be filled by the feast of St Bartholomew. The shew of prizes are to be seen in Cheapside, at the sign of the Queene's Armes, the house of Mr Dericke, goldsmith, servant to the queene."

In the reign of Queen Anne, it was thought necessary to suppress lotteries as public nuisances. Since that time, however, they have been licensed by act of parliament, under a variety of regulations. The act passed in 1778 restrains any person from keeping an office for the sale of tickets, shares, or chances, or for buying, selling, insuring, or registering, without a license; for which license each office-keeper must pay L.50, to continue in force for one year, and the produce to be applied towards defraying the expense of the lottery. And no person is allowed to sell any share or chance less than a sixteenth, on the penalty of L.50. All tickets divided into shares or chances are to be deposited in an office, to be established in London by the commissioners of the Treasury, who are to appoint a person to conduct the business thereof; and all shares are to be stamped by the said officer, who is to give a receipt for every ticket deposited with him. The numbers of all tickets so deposited are to be entered in a book, with the names of the owners, and the number of shares into which they are divided. All tickets deposited in the office are to remain there three days after the drawing. Any person keeping an office, or selling shares, or who shall publish any scheme for receiving moneys in consideration of any interest to be granted in any ticket in the said lottery, without being in possession of such ticket, shall forfeit L.500, and suffer three months imprisonment. No business is to be transacted at any of the offices after eight in the evening, except on the evening of the Saturday preceding the drawing; and no person is to keep any office for the sale of tickets in Oxford or Cambridge, on penalty of L.20. Before this regulating statute was passed, there were upwards of four hundred lottery-offices in and about London only; but the number for all Britain, as appears by the list published by authority, afterwards amounted to not more than fifty-one. Subsequently, however, they increased greatly in number.

Some further regulations to prevent the frauds committed by insurances were made in 1793. In 1808 the reports of a committee of the House of Commons disclosed a dreadful scene of vice and misery brought on by lotteries, and recommended their abolition, or at least that they should be put under other regulations. The gross sum received by government from the lottery was estimated at L.750,000 per annum, of which L.500,000 was for tickets, and the remainder for postages, stamps, &c. At length, lotteries, which had proved eminently prejudicial to public morals, by fostering among the people a propensity to gambling, and which, in a fiscal point of view, had yielded but a trifling amount of revenue to the state, were put an end to by a Treasury minute, which provided that, from and after the 18th of October 1826, they should cease and determine; and this abolition was accompanied with a prohibitory declaration against all attempts on the part of individuals to revive or continue them in any mode or form whatsoever. Some years ago, however, a bill was brought into parliament for disposing, in this sort of way, of some property in Glasgow; and, as the obnoxious denomination of lottery was carefully excluded, general terms alone being employed in the bill, it accidentally escaped notice, and thus passed into a law. But it is well understood that this took place *per incuriam*, and that any future attempt of a similar description will certainly prove unsuccessful.

LOUDEAC, an arrondissement of France, in the department of the North Coasts, extending over 624 square miles, and containing a population of 89,500 persons. It is divided into nine cantons and fifty-five communes. The capital is a town of the same name, which contains 6000 inhabitants, chiefly employed in branches of the linen trade.

LOUDON, an arrondissement in the department of the Vienne, in France, extending over 379 square miles. It contains four cantons, divided into sixty-seven communes, and is inhabited by 33,400 persons. The capital is the city of the same name, which occupies a mountainous situation. It is well built, and contains 860 houses, with 5600 inhabitants, who are occupied in tanneries, and in making thread-lace, serges, and other thin woollen goods. Long. 0. 3. W. Lat. 47. 2. N.

LOUER, a town of Hindustan, belonging to the Mahrattas, in the province of Aurungabad, situated upon the banks of the Girah River. It is in long. 74. 27. E. lat. 20. 25. N.

LOUGH NEAGH, a loch or lake of Ireland, situated in the counties of Armagh, Down, Derry, and Antrim, in the province of Ulster. This lake is twenty miles in length, and varies from eight to twelve miles in breadth. The area of this lake is computed at 100,000 acres.

Lough *Strangford*, a lake of Ireland, situated in the county of Down and province of Ulster. It was formerly known by the name of *Lough Cone* or *Lough Coyne*. It is a deep bay or inlet of the sea, about seventeen miles long and four or five broad. It reaches west as far as Downpatrick, and north as far as Comber and Newton, and by computation covers 25,775 acres Irish plantation measure.

LOUGHBOROUGH, a market-town of the county of Leicester and hundred of West Goscot, 108 miles from London, and situated on the river Soar. It has considerable trade, arising from being on a navigable canal, and on the great north road. The market is held on Thursday. The population amounted in 1801 to 4546, in 1811 to 5400, in 1821 to 7365, and in 1831 to 10,800.

LOUHANS, an arrondissement belonging to the department of the Saone and Loire, in France, extending over 605 square miles, and peopled by 78,300 persons. It is divided into eight cantons, and eighty-three communes. The chief place is a city of the same name, situated on an island formed by the junction of three small rivers. It contains 330 houses and 3250 inhabitants, who manufacture linen and woollen goods, and carry on some transit trade between Lyons and Switzerland.

LOUIS, or St Louis, *Knights of*, the name of a military order in France, instituted by Louis XIV. in 1693. Their colours were of a flame colour, and passed from left to right; the king was their grand master. There were in the order eight great crosses, and twenty-four commanders; but the number of knights was not limited. At the time of their institution, the king charged his revenue with a fund of 900,000 livres for defraying the pensions of the commanders and knights.

Louis d'Or, a French coin, first struck in the year 1640, under the reign of Louis XIII. See the article Money. By the French mint regulations it was at length made equal to twenty-four livres, or L.1 sterling. This, however, was underrating it in respect of silver; and hence, as every one preferred paying his debts in the overvalued coin, silver became the principal currency of France, the gold coins being either sent to the melting-pot, or exported. In Britain the process was reversed. Gold having, for a long period, been overvalued by our mint in respect of silver, it became the principal currency of the country.

LOUISIADE, an archipelago in the Eastern Seas, consisting of a number of islands of different sizes, interspersed with dangerous shoals and reefs, which chiefly received names from the French during their voyage in search of La Pérouse in 1793. Some of these islands are fertile and populous, and their inhabitants are a warlike race.

LOUISIANA, one of the United States of North America, is bounded on the east by the state of Mississippi, on the west by the Sabine River, on the north by the Arkansas territory, and on the south by the Gulf of Mexico. It extends from longitude 89. to 94. 5., and its extreme southern point is in latitude 28. 56. whilst its northern limit is in latitude 33. The average length is about 240 miles, and the mean breadth rather more than 200 miles, the area being estimated at 48,220 square miles. The surface of Louisiana presents great diversity of appearance, and no state in the union possesses a greater quantity of the very finest land. It includes all the varieties, from the most recent and still periodically inundated alluvial flats, to elevations which approach the magnitude of mountains; every quality of soil, from the most productive to the most sterile, from unwooded plains to dense and almost impenetrable forests. The southern part of this state, from Lake Borgne to Sabine River and from the Gulf of Mexico to Baton Rouge and Red River, is an alluvial tract of country, extending about two hundred and forty miles in length by from seventy to one hundred and forty in breadth. It is intersected by numerous rivers, bays, creeks, and lakes, which divide the country into a great number of islands. Three fourths of the state are destitute of any elevation which deserves the name of a hill. The pine woods generally have a surface of a very particular character, rising into fine swells, with table surfaces on the summit, and valleys from thirty to forty feet deep. But they in no part present the aspect of a range, and are scattered over the country like the waves of an agitated sea. The alluvial soil is level, and the swamps are dead flats. The vast prairies, which constitute a large portion of the state, present a surface as level as a frozen lake. With the exception of the shaking prairies, they are higher and drier than the savannahs of Florida. A range of hills commences by gentle undulations in Opelosas, rises gradually, and diverges towards the river Sabine. In the vicinity of Natchitoches it preserves a distance intermediate between the Sabine and Red Rivers, and increases in elevation to the western part of the state. A second line of hills, not far from Alexandria, commences on the north side of Red River, and separating between the waters of that river and Dudgemony, unites with another chain of elevations which bound the alluvial plains of the Washita as bluffs, gradually diverging from that river as they pass beyond the western limits of the state. There are likewise some considerable hills beyond the Mississippi, and in some other parts the country is high; but, generally speaking, Louisiana is one immense plain, divided into pine woods, prairies, swamps, and hickory and oak lands. The pine woods have almost invariably a poor soil. The greater proportion of the prairies is second-rate land, and some of them are even sterile. A few, however, in Opelosas, and those of Attakapas, possess great fertility. They are in general more level than those of the upper country. A very considerable extent of them has a cold clayey soil, with a hard crust near the surface. In other places the soil is of inky blackness, and in the hot and dry season it cracks into fissures of some inches in width. A considerable belt of these prairies, near the gulf, is low, marshy, and in rainy weather inundated. The bottoms are generally rich, but in very different degrees. Those of the Mississippi and Red Rivers are particularly so, and the vegetation there is remarkable for its size and luxuriance. The cotton on fresh lands of the richest quality reaches the size of a considerable shrub. The bottoms of Red River possess extraordinary fertility, and the lower courses of this stream constitute the paradise of cotton planters. The soil is said to derive its fertility from a portion of salt which is intimately mixed with it, and from its peculiar friability; and the darkish red colour which it bears is to be traced to the presence of the red oxide of iron. All the branches of Red River, and they are very numerous, partake of the character of the main stream. The other parts of Louisiana which have the richest soils are, the island of New Orleans, a narrow neck of land, insulated by various lakes and rivers. About one third of this neck is under cultivation, the other two thirds being swamp. This tract is the finest part of the rich country called the *Coast*, which is that part of the bottom of the Mississippi commencing with the first cultivation above the Balize, about forty miles below New Orleans, and extending one hundred and fifty miles above it. It is from one to two miles in breadth; and a richer tract of land of the same extent cannot be found on the globe. It is secured by an embankment, called a levee, from six to eight feet in height, and for the most part sufficiently broad to afford room for a fine road. Above the levee, on the east bank of the river, are situated the parishes of Baton Rouge and East and West Feliciana. The latter parish is pleasantly diversified with hills and valleys, and belonging to it are the richest planters and the best plantations in the state, in some of which there are from five to eight hundred acres under cultivation. West of the Mississippi there are some tracts of soil very fertile, and here the sugar-cane thrives well. A considerable portion of Attakapas is of great fertility, as are smaller portions of Opelosas, which is, however, best adapted for a grazing country. Near the Red River there occur several tracts of very fertile soil, on parts of which the richest cotton is produced. The lands on the Washita River are black, like those on the Mississippi; and the alluvions on the lower courses of this stream furnish an admirable soil for cotton, and other productions that require the same climate.

A very great proportion of the surface of this state is covered with prairies, almost all of which are so associated with one another as to form a family, the natural connection of all the branches being easily traced. The first that occur west of the Mississippi are those which are included under the general name of Attakapas; a term implying "man-eater" in the language of the savages who formerly inhabited it, and who are said to have been cannibals. It is an immense plain of grass, stretching from the Atchafalaya on the north to the gulf on the south. It is extremely fertile, innumerable herds of cattle and horses graze upon it, and at intervals are scattered over its immense surface the houses of the agriculturists. To the west of this prairie occurs that of Opelosas, still larger than the former, and computed to contain nearly 8000 square miles. It is divided, by various natural boundaries or obstructions, into a number of prairies, which have separate names and marks of distinction. The soil, though occasionally very fertile, is less so than that of Attakapas; but this deficiency is compensated by the greater salubrity of the climate, which is reckoned the healthiest in the state. There are here very considerable cotton plantations, and some of indigo; and the parish, which bears the same name, is one of the most populous in the state. Bellevue prairie is situated partly in Opelosas, partly in Attakapas, and, as its name imports, affords a delightful prospect. Calcasiu and Sabine prairies are names descriptive of the different forms, shapes, and openings of this continuous line of prairies, as it stretches along the settlements from the Plaquemine to the Sabine. Some of them are of great extent, and they all possess nearly the same characteristics. They are generally so level as to appear to the eye a perfect plain; but there occasionally occur swells and declivities, such as are sufficient to carry the water from them. The margin which borders on the gulf is commonly a wet marsh, covered with a luxuriant growth of tall reedy grass called cane-grass. In various parts of these prairies there are islands of timber lands. Wherever a bayou or stream crosses the prairie, it is marked with a fringe of timber; and here the soil is invariably rich, as well as at the points of the prairie; but towards the Sabine it is less so. Attakapas is the first and most fertile, and that of the Sabine the last and most sterile. Beyond Opelosas prairie most of the people subsist by rearing cattle, sheep, horses, and mules. Many of the horses are of the Andalusian and Numidian breed; and the cattle are excellent, though slenderly formed. Numbers of the inhabitants are French, and though often opulent, from habit and inclination they adhere to the simplicity of pastoral life and primitive nature. Thousands of cattle range the plains, there is a rustic abundance of every thing, and the land abounds in milk and honey. There are various other prairies, but as they are of less importance than those above enumerated, and moreover possess similar general features, they do not require any particular description.

Wheat and rye do not flourish here in general, but oats and barley succeed well; and maize grows luxuriantly on the alluvions and rich lands. The sweet potato, *convolvulus batatas*, in the sandy soil attains its utmost perfection. They are of different species, and occasionally of a very large size, but all are extremely nutritive, and raised with ease in great abundance. The Irish potato is not so easily raised, and is only cultivated for eating during the early part of summer. Garden vegetables generally appear to have no assignable limit upon a soil so varied, and in a climate so near the tropics. It may seem almost incredible that horticulture should be neglected in Louisiana, yet such is the case; and the fact seems the more unaccountable, when it is considered that some individual gardens present what would appear an irresistible temptation. The pumpkin and melon tribe flourish in this climate. All the northern fruits come to perfection, with the exception of apples. The apple-tree covers itself with blossoms and fruit, which, before it ripens, shows a black speck, decays, and falls. Different kinds of figs grow in the greatest abundance, and the tree would appear to attain its largest size in this quarter; but, although growing spontaneously, it is only to be found on a few farms. Along the whole shore of the gulf, and in some other places, the orange-tree, sweet and bitter, flourishes, and the fruit is of the finest quality. The cultivated vine flourishes abundantly; and wild grapes, such as the summer, winter, fox, muscadine, and pine-wood grape, are abundant. Berries are neither so common nor so good as in the north, but various kinds of wild fruit are common in the woods. There are an immense number of wild and cultivated flowering shrubs, which flourish in this region; and the abundance of mulberry trees holds out a prospect that the culture of silk will ere long form one of the branches of trade in this state. The timber-trees on the bottoms are willow, cotton-wood, honey-eye locust, pawpaw, and buck-eye; on the rich uplands, elm, cucumber, ash, hickory, mulberry, black walnut, with abundance of grape vines; and on the second rate, or sandy uplands, white, pitch, and yellow pines, and various kinds of oak. As yet agriculture is only in its infancy, the principal object being not to produce a great variety of crops, but to obtain the greatest amount of the staple productions. Sugar and rice are the staples of the state in general south of 30°, and cotton north of that parallel; the latter, however, is extensively cultivated in every part of the state. Sugar-cane is a very rich and abundant article of growth in Louisiana. It requires the richest soil, the mould of which should at least be a foot deep. There are three or four varieties or species, as the African, the Otaheitan, the West Indian, and the riband cane. The Otaheitan grows luxuriantly, and ripens considerably earlier than the West Indian; but it is said to contain saccharine matter, in comparison with the other, only as two to three. The riband cane is a new and beautiful species, which possesses the advantage of not requiring so long a season for ripening. Throughout the state the planters are turning their attention to the cultivation of the sugar-cane, and nothing yields so rich a harvest. The rice is remarkably fair, and yields abundantly. There is a great extent of land favourable for the production of the upland rice; and no limit can be assigned to the amount which might be raised. The cotton cultivated here is an annual plant, growing in the rich lands more than six feet in height, and the larger stalks of the size of a man's arm, throwing out a number of branches, on which form large and beautiful whitish-yellow blossoms. It is planted from March till the middle of May, in drill rows, six feet apart. The kinds of cotton cultivated are, Louisiana, green seed or Tennessee, and recently Mexican cotton. The green seed is not so fine a staple, but it is less subject to the destructive malady called the rot. The Mexican is of a finer staple, yields more abundantly, and has not hitherto suffered from rot. It is being commonly adopted, and the importation of seed from Tampico and Vera Cruz is becoming a considerable business. Sea Island cotton grows well upon grounds that have been exhausted by the

Louisiana.

continued cultivation of the other kinds. All the species exhaust the soil; but the seeds, which accumulate in prodigious quantities around the gins, furnish an admirable manure, which supplies the deficiency of nutriment. Attempts have been made to cultivate the tea plant; and benne, which yields an oil similar to that of olives, succeeds well. Indigo was formerly a prime object of attention amongst the planters, but the cultivation of it has been in a great measure abandoned. The finest tobacco is raised, but it is not so profitable as sugar and cotton, although that which is cultivated in the vicinity of Natchitoches is said to equal the tobacco of Cuba. Louisiana produces annually an average crop of more than 100,000 hogsheads of sugar, and five millions of gallons of molasses. It is to this individual branch of agriculture that the prosperity of the Union in general, and the west in particular, has in a great measure been attributed. Such is a sketch of the agriculture of Louisiana. We shall now describe the divisions of the state, and the principal towns belonging to it.

The state of Louisiana is, for the better arrangement in the choice of the legislature, divided into twelve counties These are,

The county of Orleans,
...... German Coast,
...... Acadia,
...... Iberville,
...... Lafourche,
...... Point Coupee,
Rapides.
Natchitoches
Concordia.
Ouachita.
Opelosas.
Attakapas.

This division was made in 1812, when the constitution by which the state is governed was first framed.

Table of the Parishes and Seats of Justice.

Parishes.	Population.	Seats of Justice.	Distance. N. O.[1]	Distance. W.[2]
EASTERN DISTRICT.				
Ascension, S. E. M.	5,400	Donaldson	75	1278
Assumption, S. E. M.	5,670	Assumption, C. H.	90	1293
Baton Rouge, East, M.	6,717	Concordia		
Baton Rouge, West, M.	3,092	Baton Rouge	117	1237
Concordia, N. E.	4,662			
Feliciana, East, E. M.	8,247	Jackson	158	1193
Feliciana, West, E. M.	8,629	St Francisville	149	1205
Iberville, S. E. M.	7,050	Iberville	98	1256
Jefferson, S. E.	6,846	Coquille	202	1149
Lafourche, Interior, S.	5,500	Thibadeauxville	108	1311
Orleans, S. E.	3,793	NEW ORLEANS		1203
New Orleans, *city and suburbs*	46,310			
Plaquemines, S. E.	4,489	Port Jackson	75	1278
Point Coupee, M.	5,936	Point Coupee	154	1210
St. Bernard, S. E. M.	3,356			
St Charles, S. E. M.	5,107			
St. Helena, E. M.	4,027	St Helena	98	1212
St. James, S. E. M.	7,672	Bringiers	60	1262
St. John Baptist, S. E. M.	5,700	Bonnet Carré	36	1241
St Tammany, E.	2,864	Covington	44	1159
Terre Bonne, S.	2,121	Williamsburgh		
Washington, E.	2,286	Franklington		1162
Total	155,474	of whom 80,421 are slaves.		
WESTERN DISTRICT.				
Avoyelles, M	3,488	Marksville	240	1247
Catahoulla, N. M.	2,576	Harrisonburgh	251	1186
Claiborne	1,764	Russellville	441	1274
Lafayette, S.	5,606	Vermillionville	192	1351
Natchitoches, N. W.	7,926	Natchitoches	354	1328
Rapides, M.	7,559	Alexandria	272	1246
St Landry, S. W.	12,552	Opelosas	192	1326
St Martin's, S.	7,204	St Martinsville	176	1366
St Mary's, S.	6,442	Franklin	131	1344
Washita, N.	5,140	Monroe	323	1258
Total	60,257	of whom 29,210 are slaves.		

	Population.	Slaves.
Eastern district	155,474	80,421
Western district	60,257	29,210
Total of Louisiana	215,731	109,631

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[1] From New Orleans.

[2] From Washington.

New Orleans, the commercial capital of the state, and the emporium of western commerce, is situated on the east bank of the Mississippi, in a bend so deep and sinuous, that the sun rises to the inhabitants of the city from the opposite shore, in north latitude 29. 57. and in longitude 98. 8. west from Greenwich. It is nearly intermediate between Boston and Mexico, although the passage from New Orleans to Vera Cruz is much shorter by sea than to Boston. It consists of the old city properly so called, which is built in the form of a parallelogram, of which the longer sides are 1320 yards in length, and the shorter, or the depth of the city towards the swamp, 700 yards. No city on the globe possesses so great natural advantages for a commercial capital as New Orleans. It has an easy communication with the ocean; and above the city there are 20,000 miles of navigation by means of the Mississippi and its numerous tributaries, whilst various bayous connect it with different parts of the state. By a basin and canal it communicates with Lake Ponchartrain, the lakes thence to the Gulf of Mexico, the opposite Florida shore, with Mobile, Pensacola, and the whole gulf-shore east and west. There is also a railroad four and a half miles long between the city and Lake Ponchartrain. Seen from the harbour, New Orleans presents a striking panoramic view. The old city is divided into six squares, each square having a front of 319 feet in length, and being divided into twelve lots. Few of the streets are more than forty feet wide. Buildings of brick have now replaced the wooden structures of which the city was formerly composed. The French and Spanish styles of building predominate, and the houses are stuccoed externally. The public buildings are, the town-house, the hospital, the cathedral church of St Louis, the convent of Ursaline nuns, the barracks, the custom-house, the market-house, five banks with a capital of 4,000,000 of dollars, a government-house, district court of the United States, water-works, two theatres, and a Presbyterian and other churches. Several of these buildings, as the cathedral, are large, commodious, and handsome. The Fauxbourg of St Mary, and other new parts of the city, are built principally of brick, after the American style; and in general the city is gradually becoming American in all its characteristics. Between the city and the bayou St John, are the villages St Johnsburg and St Claud. The commerce of this city is immense, and constantly increasing. There are sometimes in the harbour 1500 flat boats at a time; and steam-boats arrive and take their departure every hour. No place in the United States has so much activity and bustle of commerce, crowded into so small a space, in the months of February and March. During the season of bringing in the cotton crop, whole streets are barricaded with cotton bales. The amount of domestic exports from this city exceeds twelve millions of dollars a year, being greater than that of any other city of the Union excepting New York, and nearly equalling that place. The greatest items which enter into this amount are sugar and cotton. From being placed in the midst of immense swamps, New Orleans is generally considered as unhealthy, but few towns in the United States have increased with greater rapidity. The market in general is cheap and abundant, and the productions of every climate find their way thither. This city necessarily exercises a very great moral influence over all the western country; and there is not a distinguished merchant, planter, or farmer, in the Mississippi valley, who has not made at least one trip to this place. The police of the city is at once mild and efficient, and the municipal and criminal courts are prompt in administering justice. A great portion of the inhabitants of New Orleans are of French and Spanish descent, and the French language is more used than the English. During the busy season, the manners, dresses, customs, and languages of every quarter of the globe are here exhibited. The means of education in this city are very limited compared with those of the other large cities of the United States, but there have been great improvements within the last few years; and, considering that one half of the people are slaves, the state of morals is better than might be expected. The following are some of the principal imports into New Orleans for the year 1829:—Bagging, 13,472 pieces; buffalo robes, 15,210 lbs.; cotton, 269,571 bales; corn in ears, 91,882 barrels; flour, 157,323 barrels; lard, 110,206 kegs; pig lead, 146,203 pigs; deer-skins, 6215 packs; tobacco, 29,432 hhds. The amount of cotton exported in the year ending the 30th of September 1830 was 354,024 bales. Nothing seems adverse to the growth of New Orleans except the unhealthiness of its climate; but, by draining and otherwise improving it, it will probably be rendered more healthy, and become one of the largest cities in the Union.

Donaldsonville, on the west side of the Mississippi, at the efflux of Lafourche, ninety miles above New Orleans, has a number of houses, and has been selected by the legislature as the place for the future political capital of the state. Baton Rouge is on the east side of the Mississippi, 140 miles above New Orleans. It is pleasantly situated on the last bluff that is seen on descending the river. The site is thirty or forty feet above the highest overflow of the river. The United States barracks here are built in a fine style, and are supposed to be amongst the handsomest and most commodious of the kind. There is a delightful prospect from the esplanade, including a great extent of the coast, with handsome houses and rich cultivation below, and commanding an extensive view over the back country to the east. The town consists of a number of French and Spanish houses, with several green squares, and contains 1200 inhabitants. St Francisville is a considerable village, of nearly the same size as Baton Rouge. A good way to the westward of this town is Jackson, which is the seat of an incipient college. On the opposite shore is Point Coupee, a wealthy French settlement. Galveztown is situated on Bayou Manshac, or Iberville, not far from where it enters Lake Ponchartrain. Alexandria, on Red River, seventy miles from the Mississippi, and 150 from the mouth of the river by its course, is situated on the south bank of the river, half a mile below the fall. It is central to the rich planting country of Bayous Rapide, Robert, and Bœuf. It is the seat of justice for the parish, has a bank, a number of stores, and respectable attornies and physicians, and issues a weekly paper. Vast quantities of cotton are exported from this place. The last town of any size towards the south-western frontier of the United States is Natchitoches, about sixty miles above Alexandria. The Spanish trade for a considerable distance into the interior of the Mexican state centres here, and it is the great thoroughfare for people going to and returning from these states. The trade from them consists chiefly in bars of silver, and in horses and mules. Manufactured goods, groceries, spirits, and tobacco, are sent in return. This is a very considerable and growing place, and is likely to become the largest town in the country, except New Orleans. It is beautifully situated on the bank of the river, and is at the head of the steam-boat navigation. A few leagues to the west of this town is the ancient Spanish town of Adayes, the inhabitants of which are all Spanish. There are some other places, but none of such importance as to demand particular mention.

The canal which connects the city of New Orleans with Lake Ponchartrain has already been mentioned. Where it terminates, at the north of the city, there is a convenient basin, excavated entirely by art, and large enough to contain a great number of vessels. Immense labour and expense were necessary to render the river navigable, especially at the mouth of the lake, where a large and impassable bar was removed, and large piles of wood driven into the sand to prevent it from forming again. A provision in the charter of this canal corporation allows them to extend it to the Mississippi.

The roads are for the most part good, but when they diverge to any distance from the rivers they are subject to inundation. Numerous railroads and canals have been projected; and there is no country in the world where nature has done more towards forming natural canals, which a little labour would complete by artificial extensions.

The country was first peopled by the French, but the Spaniards obtained possession of some parts, and established colonies in it. It was again conquered by the English, and many of the original settlers remained in the country. It was not admitted into the federal union until 1812. From the frequency of these conquests, and the number of settlers from different nations, the character of the inhabitants is different from that of those in most of the other states. The descendants of the French possess many characteristics of that people, and formerly lived in a state of pastoral simplicity. They are mild, vivacious, and polite. The American planters are high minded, social, irascible, and generous; much addicted to hunting, gambling, and dissipation. The people generally are volatile, gay, benevolent, and easily excited to joy or sorrow. Education was formerly at a very low ebb, but latterly ample and munificent appropriations have been made, each parish in the state granting eight hundred dollars annually for that purpose. The language generally spoken is French, but in a very corrupt state. The prevailing religion is Roman Catholic, there being only a few Baptists and Methodist societies, and one Presbyterian church, in the state.

The constitution differs in some minor points from those of the other western states. The senators are elected for a period of four years, one fourth vacating their seats annually; and they must possess a property worth 1000 dollars before they can be chosen. The representatives are elected for two years, and, to be eligible, must have property in the parish worth 500 dollars. The governor is elected for four years, with a salary of 7000 dollars annually, and cannot be chosen for the next term. A supreme and circuit court exercise the judiciary power, together with a municipal or parish court. Every free white man above twenty-one years is entitled to vote in the elections, provided he has been six months in the parish, and has paid taxes. In civil jurisprudence, this state has, with some modifications, adhered to that derived from France and Spain; but in criminal matters they have followed the English jurisprudence.

This state has an extensive, and, from its great natural advantages, rapidly increasing commerce. The quantity of sugar manufactured yearly averages about 60,629 hhds.; the quantity of molasses 3,018,041 gallons, and it is expected that this state will furnish abundance of this article for the whole consumption of the United States. The tobacco exported averages 29,543 hhds. annually, and the cotton in the same period 308,243 bales. The yearly quantity, however, depends entirely upon the season. The total amount of exports and imports in 1833 was, imports 9,590,505 dollars, and exports 18,941,373 dollars. The amount received in the state for postage for the year ending the 31st of March 1832, was 4,812,898 dollars. The number of banks in 1834 was ten, having a capital of 23,664,755 dollars, and they issued notes to the amount of 4,793,730 dollars. The number of ships belonging to the state in 1830 was 399, and the number of seamen employed 4789. (R. R. R.)

LOURDE, a city of France, in the department of the Upper Pyrenees, and arrondissement of Argelés, on the Gave de Pau. It is strongly fortified, and stands at the entrance of one of the narrowest passes into the Pyrenees. It contains 2900 houses, and 3070 inhabitants. Some flax is grown, and converted into linen cloth, which is in great repute. Long. 0. 15. W. Lat. 43. 8. N.

LOURISTAN, a mountainous district in the province of Irak, in Persia, where it borders on Khusistan. This extensive tract of country, which runs along the whole frontier of Khusistan, and extends as far to the east as the longitude of 50. and to the north as far as the latitude of 33. 40. is by far the richest and most fruitful part of Irak. From this mountainous tract several large rivers descend into the level province of Khusistan, and there is hardly a valley that is not watered by many lesser streams. The pasture is not luxuriant, and no attention is paid to agriculture; the inhabitants, the Illiats, preferring a wandering life, and principally subsisting on the produce of their flocks. They are a savage and fearless race, subject to no law but the will of their chiefs, and seem to differ only in name from the rude inhabitants of the same country in the days of Alexander. They reside in black tents, even during the winter; and consequently, with the exception of Korumabad, there are no towns, and but few villages. They deduce their descent from a high antiquity, though they do not deny that their ancestors intermarried with several Turkish hordes which they had invited from Persia to settle amongst them.

LOUTH, a maritime county in the province of Leinster, in Ireland, is bounded on the north by the county of Down and the bay of Carlingford, on the east by the Irish Sea, on the south by the county of Meath, and on the west by the counties of Meath and Monaghan. It is the smallest county of Ireland, comprising only 200,484 acres, of which 185,568 are capable of cultivation, and 14,916 are bog or unprofitable mountain.

In the time of Ptolemy it formed part of the maritime district inhabited by the Voluntii. Afterwards it was known by the name of Argiall, Orgiall, or Uriell, which also comprehended the greater part of the counties of Meath, Monaghan, and Armagh. Its leading families of Irish extraction were the O'Carrols and the M'Scanlans. It was conquered by the English under De Courcy in his progress northwards to Ulster, and formed one of the twelve counties into which King John divided that part of Ireland which acknowledged his authority. It is now divided into the five baronies of Ardee, Upper and Lower Dundalk, Ferrard, and Louth, which are subdivided into sixty-one parishes, all in the archdiocese of Armagh, and two parts of parishes in the diocese of Clogher.

The southern part of the county is flat, diversified by gentle undulations of the surface. Proceeding northwards it becomes more hilly, until, at its most northern extremity, it rises into the mountains of Ravensdale and Carlingford, of considerable elevation. The rivers are the Dee, the Clyde, the Fane, and the Castletown. None of them are navigable, being useful solely for irrigation, and other purposes of rural economy. The Boyne forms part of the southern boundary of the county. It is navigable for large vessels as far as Drogheda. The county has a considerable line of sea-coast, consisting chiefly of a sandy strand, except where it is broken by the projection of Clogher Head, a bold promontory, on which is a fishing town of the same name. The bay of Dundalk extends beyond this point for seven miles at its mouth, indenting the coast for an equal distance inland. It is considered as peculiarly dangerous for shipping. The Carlingford Mountains, which bound the northern extremity of the county, separate it from the bay that takes its name from them. This latter bay, which forms the line of demarcation both between the counties of Louth and Down and the provinces of Leinster and Ulster, is deep and narrow, extending in length upwards of nine miles, with an average breadth of a mile and a half. It is navigable nearly to the town of Newry, and its shores on both sides are much admired for their bold and picturesque scenery. An oyster, in high estimation amongst gastronomes for the peculiar delicacy of its flavour, is found in this bay.

The soil in the southern lowlands is well adapted for tillage, being composed of a rich vegetable mould resting on marl or on limestone, sometimes with a substratum of slate. The quality of the soil diminishes in agricultural value as the land rises towards the north, and the summits of the mountainous district produce only heath and scanty herbage.

The mountains are composed chiefly of granite. On their borders hornblende and primitive greenstone are found in abundance, after which are exterior ranges of transition rock. The lower lands are of the clay-slate formation. The line of separation between the granite and the clay-slate extends from Carlingford Bay, over the summit of the Ravensdale Mountains, into the county of Armagh. Flœtz limestone appears in the neighbourhood of Drogheda and Ardee. A lead mine was worked for a short period at Salterstown, near the sea-coast. There is a mineral spring at Ballymascanlan.

The returns of the population, taken at different periods, present the following results:—

1760	De Burgho	67,512
1792	Beaufort	57,750
1812	Parliamentary return	—
1821	Ditto	101,011
1831	Ditto	108,168

According to the last of these returns, the ratio of population to the total number of acres in the county is as 1 to 1·85, and to the number of acres capable of profitable cultivation as 1 to 1·69.

The county, though the smallest in Ireland, sent no fewer than twelve representatives to the Irish parliament. Two were returned for the county, two for the town of Drogheda, and two for each of the boroughs of Dundalk, Ardee, Carlingford, and Dunleer. But the act of union reduced this number to four, two for the county, one for Drogheda, and one for Dundalk; and this arrangement continues under the reform act.

The number of freeholders entitled to vote at elections of representatives for the county in parliament, at three periods, 1*st*, previously to the disqualification of the forty-shilling freeholders, 2*d*, subsequently to their disqualification, and, 3*d*, under the reform act, is as follows:—

Year.	L.50.	L.20.	L.10.	40s.	Total.
Jan. 1, 1829,	274	58	—	2343	2675
Jan. 1, 1830,	307	102	286	—	695
May 1, 1831,	295	113	380	—	788

Under the provisions of the act passed in 1836, the constabulary is to be placed under a sub-inspector, under whom there are to be five chief constables, ten head constables, and eighty constables and sub-constables. The number of the constabulary previously to this new arrangement was four chief constables and eighty sub-constables, which were maintained at an annual expense of L.3578, being at an average of L.43 nearly.

The state of education, according to the returns made to parliament in 1821 and 1824–26, is as follows:—

Year.	Boys.	Girls.	Sex not ascertained.	Total.
1821,	2740	1182	—	3922
1824–26,	4291	2584	101	6976

Of the number stated in the latter of these returns, 81 were of the Established Church, 5664 were Roman Catholics, and ninety-five Dissenters; the religious persuasion of thirty-six was not ascertained. The total number of schools was 169, of which twenty-one, affording education to 1358 children, were supported by grants of public money; twenty, affording education to 1106, were supported by the voluntary contributions of societies or individuals; and the remaining 128, in which 4512 children received instruction, were supported wholly by the fees of the pupils. There is an endowed classical school at Dundalk, on the endowment of Erasmus Smith.

The lands capable of cultivation are mostly kept in tillage. Potatoes, wheat, oats, and barley, raised according to the succession here stated, form the principal crops. In the northern districts, oats are chiefly raised. The systems generally adopted are those of the most approved kind, as are also the implements employed. From the attention paid to introduce the best breeds of cattle of every denomination, the different species cannot now be easily distinguished. Sheep are most abundant in the hilly districts. Many parts of the county are well planted; the neighbourhood of Collon particularly exhibits a fine specimen of the attention paid by its proprietor to this mode of improving and embellishing the country. The ash-tree grows in the lower grounds to a great size. The coasts furnish a constant supply of fish; and the flat shores abound with sea-fowl, especially barnacle, which, however, is not so highly esteemed for flavour as that of Wexford or Derry. The manufacture of coarse linens is carried on to a considerable extent, and latterly the cotton manufacture has gained ground.

The appearance of the dwellings of the peasantry in the smaller towns and villages indicates a considerable degree of comfort. In the hilly and more remote districts it deteriorates considerably. In their manners, food, and clothing, they differ in no respect from those of the neighbouring portions of Leinster and Ulster. Fuel is scarce, except in the vicinity of the sea-ports, into which English and Scotch coal is imported.

Few counties can boast of so many remains of antiquity. There are two round towers, one at Monasterboice, 110 feet in height, and in a state of excellent preservation; the other at Dromiskin, much decayed. At the former of these places there are also the remains of two chapels, and of two finely-sculptured crosses, one of them eighteen feet high. Near the banks of a stream called the river of Balrichan, is a large artificial cave, accidentally discovered by the sinking in of a horse whilst ploughing. It consists of several narrow passages, the sides and top of which are formed of flag-stones. Some bones of large and small animals were found in it. About two miles from Dundalk are the ruins of a very ancient structure, which has some resemblance to the hull of an ancient galley. There are no traces of doors, windows, or loop-holes. The building has given rise to much antiquarian discussion. At Ballymascanlan is a cromleach called the Giant's Load. It consists of a rock twelve feet long and six broad, elevated on three upright stones. Near it is Castle Rath, surrounded by moats and lesser raths, and with a remarkable tumulus in its vicinity. The great mound of Castleguard, near Ardee, is ninety feet in height, and 600 feet in circumference at its base. Its summit terminates in an area 140 feet round. It is well planted, and surrounded by a deep trench. At Faughart are the remains of an ancient intrenchment. The decisive battle which terminated in the defeat and death of Edward Bruce, by Sir John Bermingham, afterwards Lord Louth, was fought near this place. The remains of castles are numerous. That of Carlingford, built by King John, occupies a commanding position on a rock projecting into the bay. Castletown stands within sight of the town of Dundalk. Terfeckan Castle, once the residence of the learned Archbishop Usher, is now utterly in ruins. The county is equally remarkable for the number of its ancient monastic edifices. Mellifont, a Cistertian abbey, five miles west of Drogheda, presents some remains equally remarkable for their beauty and singularity of architecture. Others are to be traced at Carlingford, Faughart, and Monasterboice.

The principal modern seats are, Collon, the residence of Lord Oriell; Barmeath, belonging to the Bellew family; Rokeby Hall, the mansion of the Count de Salis; Louth Hall, that of Lord Louth; Ravensdale Park; and Clermont.

Dundalk, the county-town, a place of great antiquity, is situated at the mouth of the Castletown River. It consists of one long street, intersected by some cross passages. Its most remarkable building is the court-house, the front of which, modelled from the temple of Theseus at Athens, is considered as the finest specimen of pure Grecian architecture in Ireland. The other public buildings are, the parish church, two Roman Catholic chapels, a large barrack, a gaol, assembly and news rooms, a linen-hall, a charter school, and an infirmary. Dundalk is a great mart for the export of grain. The harbour is commodious but shallow. The cambric manufacture is carried on to some extent. Its population, in 1831, amounted to 10,078 souls. The other towns containing a population of upwards of one thousand souls are, Ardee 3975, Carlingford 1319, Collon 1153.

Louth, a market-town of the county of Lincoln, in the hundred of Louth Eske, in Lindsay division. It is 144 miles from London, being situated on the river Lud, from which a canal has been constructed, communicating with the sea, about seven miles distant. It has a considerable coasting trade, and good markets on Wednesdays and Saturdays. It is governed by a corporate body, composed of a warden and six assistants. The population amounted in 1801 to 4236, in 1811 to 4728, in 1821 to 6012, and in 1831 to 6927.

LOUVAIN, or Loewen, a circle of the province of South Brabant, in the Netherlands. It comprehends eight cantons, divided into 144 communes, containing 133,840 inhabitants. The capital is the city of the same name, situated on the river Dyle. It has water communication by the Louvain Canal with Mechlin, and by the river Rupel with the Scheldt. Its walls are extensive, but three fourths of the land they encompass consist of fields and gardens. It contains 4000 houses, and 25,000 inhabitants, who carry on extensive breweries and distilleries, spin cotton twist, print calicoes, and grind much corn into flour. It is the seat of an ancient university, and has a stadthouse of Gothic architecture, constructed by Charlemagne. Long. 4. 36. E. Lat. 50. 33. N.

LOUVIERS, an arrondissement of the department of the Eure, in France, extending over 410 square miles, and inhabited by 65,800 persons. It is divided into five cantons and 122 communes. The capital is the city of the same name, situated on the river Eure. It stands on an island formed by two arms of that river, and is surrounded with walls and ditches. It contains 1050 houses, with 7500 inhabitants, who make some of the finest cloths and casimeres in France, and manufacture several kinds of cotton goods. Long. 1. 5. E. Lat. 49. 10. N.

LOVE, in the enlarged sense of the word, denotes all those affections of the pleasing kind which objects and incidents excite in our minds. Thus we are said to *love* not only intelligent agents of morally good dispositions, but also sensual pleasures, riches, and honours.

But *love*, in its usual and more appropriate signification, may be defined, "that affection which, being compounded of animal desire, esteem, and benevolence, becomes the bond of attachment and union between individuals of the different sexes, and makes them enjoy in the society of each other a species of happiness which they experience nowhere else." We call it an *affection* rather than a *passion*, because it involves a desire of the happiness of its object; and that its constituent parts are such as have just been enumerated we shall first endeavour to prove, and then proceed to trace its rise and progress from a selfish appetite to a generous sentiment.

Mere animal desire has nothing in view but the species and the sex of its object; and before it makes a selection, it must be combined with sentiments very different from itself. The first sentiment with which it is combined, and by which a man is induced to prefer one woman to another, seems to be that by which we are delighted with gracefulness of person, regularity of features, and beauty of complexion. It is not indeed to be denied that there is something irresistible in female beauty. The most severe will not pretend that they do not feel an immediate prepossession in favour of a handsome woman; but this prepossession, even when combined with animal desire, does not constitute the whole of that affection which is called *love*. Savages feel the influence of the sensual appetite, and it is extremely probable that they have some ideas of beauty; but amongst savages the affection of love is seldom known. Even amongst the lower orders of society it seems to be a very gross passion, and to have in it more of the selfishness of appetite than of the generosity of esteem. To these observations many exceptions will no doubt be found;[1] but we speak of savages in general, and of the great body of the labouring poor, who, in the choice of their mates, do not study, and indeed are incapable of studying, that rectitude of mind, and those delicacies of sentiment, without which neither man nor woman can deserve to be esteemed.

In the savage state, and even in the first stages of refinement, the bond of union between the sexes seems to consist of nothing more than mere animal desire and instinctive tenderness for their infant progeny. The former impels them to unite for the propagation of the species, and the latter preserves the union until the children who are the fruit of it be able to provide for their own subsistence. That in such unions, whether casual or permanent, there is little mutual esteem and benevolence, is apparent from the state of subjection in which women are held in rude and uncultivated nations, as well as from the manner in which marriages are contracted.

Sweetness of temper, a capital article with us in the female character, displays itself externally in mild looks and gentle manners, and is the first and perhaps the most powerful inducement to love in a cultivated mind. "But such graces," says Lord Kames, "are scarce discernible in a female savage, and even in the most polished woman would not be perceived by a male savage. Among savages, strength and boldness are the only valuable qualities. In these, females are miserably deficient; for which reason they are contemned by the males, as beings of an inferior order. The North American tribes glory in idleness; the drudgery of labour degrades a man in their opinion, and is proper for women only. To join young persons in marriage is accordingly the business of the parents; and it would be unpardonable meanness in the bridegroom to show any fondness for the bride. In Guiana a woman never eats with her husband, but after every meal attends him with water for washing; and in the Caribbee islands she is not even permitted to eat in the presence of her husband. Dampier observes in general, that among all the wild nations with which he was acquainted, the women carry the burdens, while the men walk before and carry nothing but their arms; and that women even of the highest rank are not better treated. In Siberia, and even in Russia, the capital excepted, men, till very lately, treated their wives in every respect like slaves. It might indeed be thought that animal desire, were there nothing else, should have raised women to some degree of estimation among men; but male savages, utter strangers to decency and refinement, gratify animal desire with as little ceremony as they do hunger or thirst. Hence it was that in the early ages of society a man purchased a woman to be his wife, as one purchases an ox or a sheep to be food; and valued her only as she contributed to his sensual gratification."

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[1] Such as that of the negroes whose story is so pathetically told by Addison (*Spectator*, No. 215); the two lovers who were killed by lightning at Staunton-Harcourt (Pope's *Letters*); and many others which will readily occur to every reader.

But if amongst savages and the vulgar, love be unknown, it cannot possibly be an instinctive affection; and therefore it may be asked how it gets possession of the human heart, and by what means we can judge whether in any particular instance it be real or imaginary. These questions are of importance, and deserve to be fully answered, though many circumstances conspire to render it no easy task to give to them such answers as may be perfectly satisfactory. Love can subsist only between individuals of the different sexes. A man can hardly love two women at the same time; and we believe that a woman is still less capable of loving at once more than one man. Love, therefore, has a natural tendency to make men and women pair, or, in other words, it is the source of marriage; but in polished society, where alone this affection has any place, so many things besides mutual attachment are necessary to make the married life comfortable, that we rarey see young persons uniting from the impulse of love, and have therefore but few opportunities of tracing the rise, progress, and consequences of the affection. We shall, however, throw together such reflections as have occurred to us on the subject, not without indulging a hope that they may be useful to the younger part of our readers when forming the most important connexion in life.

We have said that the perception of beauty, combined with animal desire, is the first inducement which a man can have to prefer one woman to another. It may be added, that elegance of figure, a placid masculine countenance, with a person which indicates strength and agility, are the qualities which first tend to attach any woman to a particular man. Beauty has been defined by Buffier, "that particular form which is the most common of all particular forms to be met with in the same species of beings." Let us apply this definition to our own species, and try, by means of it, to ascertain what constitutes the beauty of the human face. It is evident, that of countenances we find a number almost infinite of different forms; of which, however, one only constitutes beauty, whilst the rest, however numerous, constitute what is not beauty, but deformity or ugliness. To an attentive observer, however, it is evident, that of the numerous particular forms of ugliness, there is not one which includes so many faces as are formed after that particular cast which constitutes beauty. Every particular species of the animal as well as the vegetable creation may be said to have a fixed or determinate form, to which, as to a centre, nature is continually inclining. Or it may be compared to pendulums vibrating in different directions over one central point; and as they all cross the centre, though only one passes through any other point, so it will be found that perfect beauty is oftener produced by nature than deformity; we do not mean than deformity in general, but than any one kind and degree of deformity. To instance in a particular part of a human feature; the line which forms the ridge of the nose is deemed beautiful when it is straight; but this is likewise the central form, which is oftener found than any one particular degree of concave, convex, or any other irregular form that may be proposed. As we are then more accustomed to beauty than deformity, we may conclude that that is the reason why we approve and admire it, just as we approve and admire fashions or dress for no other reason than that we are used to them. The same thing may be said of colour as of form. It is custom alone which determines our preference of the colour of the Europeans to that of the Ethiopians, and which makes them prefer their own colour to ours; so that though habit and custom cannot be the cause of beauty, they are certainly the cause of our liking it.

That we do like it cannot be denied. Every one is conscious of a pleasing emotion when contemplating beauty either in man or woman; and when that pleasure is combined with the gratification of the sensual appetite, it is obvious that the sum of enjoyment must be greatly increased. The perception of beauty, therefore, necessarily directs the energy of the sensual appetite to a particular object; but still this combination is a mere selfish feeling, which regards its object only as the best of many similar instruments of pleasure. Before it can deserve the name of love, it must be combined with esteem, which is never bestowed but upon moral character and internal worth; for let a woman be ever so beautiful, and of course ever so desirable as an instrument of sensual gratification, if she be not possessed of the virtues and dispositions which are peculiar to her sex, she will inspire no man with a generous affection. With regard to the outlines, indeed, whether of internal disposition or of external form, men and women are the same; but nature, intending them for mates, has given them dispositions which, though concordant, are however different, so as to produce together delicious harmony. "The man, more robust, is fitted for severe labour, and for field exercise; the woman, more delicate, is fitted for sedentary occupations, and particularly for nursing children. The man, bold and vigorous, is qualified for being a protector; the woman, delicate and timid, requires protection. Hence it is that a man never admires a woman for possessing bodily strength or personal courage; and women always despise men who are totally destitute of these qualities. The man, as a protector, is directed by nature to govern; the woman, conscious of inferiority, is disposed to obey. Their intellectual powers correspond to the destination of nature. Men have penetration and solid judgment to fit them for governing, women have sufficient understanding to make a decent figure under a good government; a greater portion would excite dangerous rivalship between the sexes, which nature has avoided by giving them different talents. Women have more imagination and sensibility than men, which make all their enjoyments more exquisite; at the same time that they are better qualified to communicate enjoyment. Add another capital difference of disposition: The gentle and insinuating manners of the female sex tend to soften the roughness of the other sex; and wherever women are indulged with any freedom, they polish sooner than men.

"These are not the only particulars that distinguish the sexes. With respect to the ultimate end of love, it is the privilege of the male, as superior and protector, to make a choice; the female preferred has no privilege but barely to consent or to refuse. Whether this distinction be the immediate result of the originally different dispositions of the sexes, or only the effect of associations inevitably formed, may be questioned; but among all nations it is the practice for men to court, and for women to be courted; and were the most beautiful woman on earth to invert this practice, she would forfeit the esteem, however by her external grace she might excite the desire, of the man whom she addressed. The great moral virtues which may be comprehended under the general term integrity, are all absolutely necessary to make either men or women estimable; but to procure esteem to the female character, the modesty peculiar to their sex is a very essential circumstance. Nature hath provided them with it as a defence against the artful solicitations of the other sex before marriage, and also as a support of conjugal fidelity."

A woman, therefore, whose dispositions are gentle, delicate, and rather timid than bold, who is possessed of a large share of sensibility and modesty, and whose manners are soft and insinuating, must, upon moral principles, command the esteem and benevolence of every individual of the other sex who is possessed of sound understanding; but if her person be deformed, or not such as to excite some degree of animal desire, she will attract no man's love. In like manner, a man whose moral character is good, whose understanding is acute, and whose conversation is instructive, must command the esteem of every sensible and virtuous woman; but if his figure be disagreeable, his manner unpolished, his habits slovenly, and, above all, if he be deficient in personal courage, he will hardly excite desire in the female breast. It is only when the qualities which command esteem are, in the same person, united with those which excite desire, that the individual so accomplished can be an object of love to one of the other sex; but when these qualities are thus united, each of them increases the other in the imagination of the lover. The beauty of his mistress gives her, in his apprehension, a greater share of gentleness, modesty, and every thing which adorns the female character, than perhaps she really possesses; whilst his persuasion of her internal worth makes him, on the other hand, apprehend her beauty to be absolutely unrivalled.

To this theory an objection readily offers itself, which it is incumbent upon us to obviate. Men and women sometimes fall in love at first sight, and very often before they have opportunities of forming a just estimate of each other's moral character. How is this circumstance to be reconciled with the progressive generation of love? We answer, by an association of ideas, which is formed upon principles of physiognomy. Every passion and habitual disposition of mind gives a particular cast to the countenance, and is apt to discover itself in some feature of the face. This we learn by experience; and in time, without any effort of our own, the idea of each particular cast of countenance comes to be so closely associated in our minds with the internal disposition which it indicates, that the one can never afterwards be presented to our view without instantly suggesting the other to the imagination. Hence it is that every man, who has been accustomed to make observations, naturally forms to himself, from the features and lineaments of a stranger's face, some opinion of his character and fortune. We are no sooner presented to a person for the first time, than we are immediately impressed with the idea of a proud, a reserved, an affable, or a good-natured man; and upon our going into a company of absolute strangers, our benevolence or aversion, our awe or contempt, rises instantly towards particular persons, before we have heard them speak a word, or know so much as their names or designations. The same thing happens when we are presented to the fair sex. If a woman, seen for the first time, have that particular cast of countenance, and that expression of features, with which we have associated notions of gentleness, modesty, and other female virtues, she instantly commands our esteem; and if she have likewise so much beauty as to make her an object of particular desire, esteem and desire become suddenly combined, and that combination constitutes the affection of love. Such, too, is the nature of all mental associations, that each part of which they are composed adds strength and vividness to the other parts; so that, in the present instance, desire makes us imagine virtues in the woman which her countenance perhaps does not indicate, and the virtues which are there actually visible make us apprehend her beauty as more perfect than it is.

LOVE, in *Medicine.* The symptoms produced by this passion as a disease, according to medical writers, are various. The eyelids often twinkle; the eyes are hollow, and yet appear as if full with pleasure; the pulse is not peculiar to the passion, but the same with that which attends solicitude and care. When the object of this affection is thought of, particularly if the idea be sudden, the spirits are confused, the pulse changes, and its force and time are very variable. In some instances, the person is sad and watchful; in others, the person, not being conscious of his state, pines away, is slothful, and regardless of food; though the wiser, when they find themselves in love, seek pleasant company and active entertainments. As the force of love prevails, sighs grow deeper; a tremor affects the heart and pulse; the countenance is alternately pale and red; the voice is suppressed in the fauces; the eyes grow dim; cold sweats break out; sleep absents itself, at least until the morning; the secretions become disturbed; and a loss of appetite, a hectic fever, melancholy, or perhaps madness, if not death, constitutes the catastrophe. (On this subject the curious may consult Ægineta, lib. iii. 17; Oribat. *Synon.* lib. viii. cap. 9; or a treatise on Love as a distemper, by John Ferrard, Oxford, 1640.)

The manners of the Greeks and Romans were similar to each other in the affairs of love. They generally made a discovery of their passion by writing upon trees, walls, doors, and other places, the name of their beloved. They usually decked the door of their dulcinea with flowers and garlands, and made libations of wine before their houses, sprinkling the posts with the same liquor, as if the object of their affection was a real goddess. For a man's garland to be untied, and for a woman to compose a garland, were held to be indubitable indications of love.

When their love was without success, they used several arts to excite affection in the object of their desire. They had recourse to enchantresses, of whom the Thessalian were in the highest estimation. The means made use of were most commonly philtres or love potions, the operation of which was violent and dangerous, and frequently deprived such as drank them of their reason. Some of the most remarkable ingredients of which they were composed were the hippomanes, the jynx, insects bred from putrefaction, the fish remora, the lizard, the brains of a calf, the hairs on the tip of a wolf's tail, his secret parts, the bones of the left side of a toad eaten with ants, the blood of doves, the bones of snakes, feathers of screech-owls, twisted cords of wool in which a person had hanged himself, rags, torches, reliques, a nest of swallows buried and famished in the earth, bones snatched from hungry bitches, the marrow of a boy famished in the midst of plenty, dried human liver; to which may be added several herbs growing out of putrid substances. Such were the ingredients that entered into the composition of that infernal draught called a love potion.

But, besides the philtres, various other arts were used to excite love; in which the application of certain substances was to have a magical influence on the person against whom they levelled their skill. A hyena's udder worn under the left arm, they fancied would draw the affections of whatever woman they fixed their eyes upon. That species of olives called *μιτυρα*, and barley-bran made into a paste, and thrown into the fire, they thought would excite the passion of love. Flour was used with the same intention; and burning laurel, and melted wax, were supposed to have a similar effect. When one heart was to be hardened and another mollified, clay and wax were exposed to the fire together. Images of wax were frequently used, representing the persons on whom they wished to make an impression; and whatever was done to the substitute of wax, they imagined was felt by the person represented. Enchanted medicaments were often sprinkled upon some part of the house where the person resided. Love-pledges were supposed to be of singular use and efficacy; these they placed under the threshold, to preserve the affections of the owner from wandering. Love-knots were also of singular power, and the number three was particularly observed in all they did. But no good effect was expected if the use of these things had not been attended with charms or magical verses and forms of words.

Having mentioned their arts of exciting love, it may not be amiss to take notice that the ancients imagined that love excited by magic might be allayed by more powerful spells and medicaments, or by application to demons more powerful than those who had been concerned in raising that passion. But love inspired without magic had no cure; Apollo himself could find no remedy, but exclaimed, "Hei mihi quod nullis amor est medicabilis herbis." The antidotes against love were generally, *agnus castus*, which has the power of weakening the generative faculty; sprinkling the dust in which a mule had rolled herself; tying toads in the hide of a beast newly slain; applying amulets of minerals or herbs, which were supposed of great efficacy in other cases; and invoking the assistance of the inferior deities. Another cure for love was bathing in the waters of the river Selemnus; to which we may add, the lover's leap, or jumping down from the Leucadian promontory.

LOVERE, a city of Italy, in the delegation Bergamo, and the Austrian government of Milan. It is situated on the lake Iseo, in the beautiful vale of Cavallino, and has a church and several religious houses, with 4010 inhabitants, who carry on some woollen manufactories.

LOWANCE, a considerable river of Persia, in the province of Mekran. It runs through a fertile valley, on the banks of which there is a considerable number of inhabitants, who live in tents, and are industrious cultivators. Lowance is fifty miles west of Bayla.

LOWASHAN, a province of the Burman empire, situated between the twenty-second and twenty-fourth degrees of north latitude. On the north and east it is bounded by the province of Yunan in China, on the south by the country of Yunshan, and on the west by Ava proper. The country is watered by the Lookiang or Thalnayn river. It is mountainous, and but little known.

LOW-BELL, in birding, a name given to a bell by means of which birds are taken in the night, in open champaign countries, and amongst stubble. The method is to go out about nine o'clock at night in a still evening, when the air is mild and the moon does not shine. The low-bell should be of a deep and hollow sound, and of such a size that a man may conveniently carry it in one hand. The person who carries it makes it toll all the way he goes, as nearly as may be, in the same manner in which the bell on the neck of a sheep tolls as it goes on and feeds. There must also be a box made like a large lanthorn, about a foot square, and lined with tin, but with one side open. Two or three great lights are to be set in this; and the box is to be fixed to the person's breast, with the open side forwards, so that the light may be cast forward to a great distance. It will spread as it goes out of the box, and distinctly show to the person that carries it whatever there is in the large space of ground over which it extends, and consequently all the birds that roost upon the ground. Two persons must follow him who carries the box and bell, one on each side, so as not to be within the reach of the light to show themselves. Each of these is to have a hand-net, of about three or four feet square, fastened to a long stick or pole; and on whichever side any bird is seen at roost, the person who is nearest is to lay his net over it, and take it with as little noise as possible. When the net is over the bird, the person who laid it is not to be in a hurry to take the bird, but must stay till he who carries the light is got beyond it, that his motions may not be discovered. The blaze of the light and the noise of the bell terrify and amaze the birds in such a manner that they remain still to be taken; but the people who are engaged in the work must keep as quiet and still as may be. Some people are fond of going on this sport alone. The person then fixes the light box to his breast, and carries the bell in one hand and the net in the other; the net in this case may be somewhat smaller, and the handle shorter. When more than one are out at a time, it is always proper to carry a gun, as it is no uncommon thing to spy a hare when on this expedition.

LOWER, RICHARD, an eminent English physician in the seventeenth century, was born in Cornwall, and educated at Westminster school and Oxford. He afterwards studied medicine, and practised under Dr Thomas Willis, whom he instructed in some parts of anatomy, especially when the latter was writing his *Cerebri Anatome.* In 1674, Lower, along with Dr Willis, discovered the medicinal waters at Ashop, in Northamptonshire, which, upon their recommendation, became very much frequented. In 1666, he followed Dr Willis to London, practised physic under him, and became a fellow of the Royal Society, and also of the College of Physicians. In 1669 he published his *Tractatus de Corde;* and after the death of Dr Willis in 1675, he was esteemed the most eminent physician in London. Upon the breaking out of the Popish Plot in 1678, he closed with the Whigs, supposing that that party would carry all before them; but being mistaken, he lost his credit and practice together. Lower died in 1691.

LOWERING, amongst distillers, a term employed to express the debasing the strength of any spirituous liquor, by mixing water with it. The standard and marketable price of these liquors is fixed in regard to a certain strength in them called *proof;* or that strength which makes them, when shaken in a phial or poured from on high into a glass, retain for some time a froth or crown of bubbles. In this state spirits consist of about half pure or totally inflammable spirit, and half water; and if any foreign or home spirit be exposed to sale, and found to have that proof wanting, scarcely any body will buy it until it has been distilled again and brought to the proper strength; and if it be above that strength, the proprietor usually adds water to bring it down to the standard. There is another kind of lowering amongst the retailers of spirituous liquors to the vulgar, by reducing it under the standard proof. Whoever has the art of doing this without destroying the bubble proof, which is easily done by means of some addition which gives a greater tenacity to the parts of the spirits, will deceive all who judge by this proof alone. In this case the best way to judge of liquors is by the eye and the tongue, and especially by the instrument called the hydrometer.

LOWESTOFF, a town of the county of Suffolk, in the hundred of Mutford with Lothingland, 114 miles from London. It stretches along a cliff two furlongs from the sea-shore. It has a considerable share of the herring, as well as of the mackerel fishery, and is much frequented for sea-bathing in the summer. A canal uniting Norwich with the sea at this place has been recently finished, and promises to add to its prosperity. The church is a fine Gothic building. The market is held on Wednesday. The population amounted in 1801 to 2332, in 1811 to 3189, in 1821 to 3675, and in 1831 to 4394.

LOWTH, DR WILLIAM, a learned and pious divine, born at London in 1661, was the son of an apothecary, and took his degrees at Oxford. His eminent worth and learning recommended him to Dr Mew, bishop of Winchester, Lowth.

who made him his chaplain, gave him two livings in Hampshire, and conferred upon him a prebend in the cathedral of Winchester. Although he had acquired an unusual share of critical learning, the labours of Mr Lowth were strictly confined within the limits of his own province, and he applied solely to the peculiar duties of his function; yet, in order that he might acquit himself the better in theology, he pursued his studies with a more general and extensive view. Few were more deeply versed in critical learning, there being scarcely any ancient author, Greek or Latin, profane or ecclesiastical, which he had not read with accuracy, constantly accompanying his reading with critical and philological remarks. Of his collections in this way he was upon all occasions very communicative. Hence his notes on Clemens Alexandrinus, which are to be met with in Potter's edition of that father; and his remarks on Josephus, communicated to Hudson for his edition, and acknowledged in the preface; as also those larger and more numerous annotations upon the Ecclesiastical Historians, inserted in Reading's edition of them at Cambridge. The author of the *Bibliotheca Biblica* was indebted to him for the same kind of assistance. Chandler, bishop of Durham, whilst engaged in his Defence of Christianity, from the Prophecies of the Old Testament, against the Discourse of the Grounds and Reasons of the Christian Religion, and in his Vindication of the Defence, in answer to the Scheme of Literal Prophecy considered, held a constant correspondence with Lowth, and consulted him upon many difficulties which occurred in the course of that work. But the most valuable part of his character was that which least appeared in the eyes of the world; the private and retired part, that of the good Christian and the useful parish priest. His piety, his diligence, his hospitality and beneficence, rendered his life highly exemplary, and greatly enforced his public exhortations. He married Margaret, daughter of Mr Robert Pitt, of Blandford, by whom he had two sons and three daughters; and died in 1732, when, by his own orders, he was buried in the churchyard of Buriton. He published, 1. A Vindication of the Divine Authority and Inspiration of the Old and New Testaments; 2. Directions for the profitable reading of the Holy Scriptures; 3. Commentaries on the Prophets; and some other works.

Lowth, *Dr Robert*, second son of the preceding Dr William Lowth, and successively bishop of St David's, Oxford, and London, was born on the 29th of November 1710, probably at Buriton, in the county of Hants. He received the rudiments of his education at Winchester College, where his school exercises were distinguished by uncommon elegance; and having resided the requisite number of years in that seminary, he in 1730 succeeded to a place on the foundation at New College, Oxford. He took the degree of master of arts on the 8th of June 1737. Though his abilities must have been known to those with whom he was connected, he was not forward to appear before the world as a writer. At Oxford he continued many years improving his talents, with little notice from the great, and with so small preferment that, at this time, he escaped the distinct recollection of some of his contemporaries.

He was not, however, suffered to languish for ever in obscurity. His genius and his learning forced themselves upon the notice of the illustrious society of which he was a member; and he was placed in a station where he was eminently qualified to shine. In 1741 he was elected by the university to the professorship of poetry, re-elected in 1743, and, whilst he held that office, he read his admirable lectures *De Sacra Poesi Hebræorum*. In 1744 Bishop Hoadly collated him to the rectory of Ovington in the county of Hants; added to it, nine years afterwards, the rectory of East Weedhay in the same county; and in the interim raised him to the dignity of archdeacon of Winchester. These repeated favours he some years afterwards acknowledged in the following manly and respectful terms of gratitude: "This address, my lord, is not more necessary on account of the subject, than it is in respect of the author. Your lordship, unsolicited and unasked, called him from one of those colleges to a station of the first dignity in your diocese, and took the earliest opportunity of accumulating your favour upon him, and of adding to that dignity a suitable support. These obligations he is now the more ready thus publicly to acknowledge, as he is removed out of the reach of further favours of the like kind. And though he hath relinquished the advantages so generously conferred on him, yet he shall always esteem himself highly honoured in having once enjoyed the patronage of the great advocate of civil and religious liberty."

On the 8th of July 1754 the university of Oxford conferred upon him the degree of doctor of divinity by diploma; an honour which, as it is never granted but to distinguished merit, was probably conferred on Mr Lowth in consequence of his prelections on Hebrew poetry, which had then been recently published. Having in 1749 travelled with Lord George and Lord Frederick Cavendish, he had a claim upon the patronage of their family; and in 1755 the Duke of Devonshire being then lord lieutenant of Ireland, Dr Lowth went to that kingdom as his grace's first chaplain. Soon after this appointment he was offered the bishopric of Limerick; but having preferred a less dignified station in his own country, he exchanged it with Dr Leslie, prebendary of Durham and rector of Sedgefield, for these preferments. In November 1765 he was chosen a fellow of the Royal Society. In June 1766 he was, on the death of Dr Squire, preferred to the bishopric of St David's, which, in the October following, he resigned for that of Oxford, vacant by the translation of Bishop Hume to Salisbury. In April 1777 he was translated to the see of London, vacant by the death of Bishop Terrick; and in 1783 he declined the offer of the primacy of all England.

Having been grievously afflicted with the stone, and having long borne the severest sufferings of pain and sickness with the most exemplary fortitude and resignation, this great and good man died at Fulham on the 3d of November 1787; and on the 12th his remains were privately interred in a vault at Fulham church, near to those of his predecessor. He had married in 1752, Mary, the daughter of Laurence Jackson of Christ Church, Hampshire, by whom he had two sons and five daughters. His lady and two children only survived him.

His literary character may be estimated from the value and the importance of his works, in the account of which we may begin with his *Prelections on Hebrew Poetry.* The choice of so interesting a subject naturally attracted general attention; and the work has been read with equal applause abroad and at home. In these Prelections the author has acquitted himself in the most masterly manner, as a poet, a critic, and a divine; and such is the classical purity of his Latin style, that though we have read the work with the closest attention, and with no other view than to discover, if possible, Anglicisms in the composition, we found not a single phrase to which, we believe, a critic of the Augustan age would have objected. This is an excellence to which neither Milton nor Johnson has attained, to which indeed no other English writer of Latin with whom we are acquainted has attained, unless, perhaps, Bishop Atterbury be excepted. To the Prelections was subjoined a short confutation of Bishop Hare's system of Hebrew metre, which occasioned a Latin letter from Dr Edwards of Clare Hall, Cambridge, to Dr Lowth, in vindication of the Hare metre. To this the author of the Prelections replied in a larger confutation, in which Bishop Hare's system is completely overthrown, and the fallacy upon which it was built accurately investigated and exposed. After much attentive consideration, Bishop Lowth has pronounced the metre of the Hebrews to be perfectly irrecoverable.

In 1758 he published *The Life of William of Wykeham*, bishop of Winchester, with a dedication to Bishop Hoadly, which involved him in a dispute concerning a decision which that bishop had lately pronounced respecting the wardenship of Winchester College. This controversy was on both sides carried on with such ability, that, though relating to a private concern, it may yet be read, if not with pleasure, at least with improvement. The life of Wykeham is drawn from the most authentic sources, and affords much information concerning the manners, and some of the public transactions, of the period in which Wykeham lived, whilst it displays some private intelligence respecting the two literary societies of which he was the founder. In these societies Dr Lowth was educated, and he gratefully expresses his obligations to them.

In 1762 was first published his *Short Introduction to English Grammar*, which has since gone through so many editions. It was originally designed only for private and domestic use; but its judicious remarks being too valuable to be confined to a few, the book was given to the world; and the excellence of its method, which teaches what is right by showing what is wrong, has insured public approbation and very general use. In 1765 Dr Lowth was engaged with Bishop Warburton in a controversy, which made much noise at the time, and attracted the notice even of royalty itself. If we do not wish to dwell upon the particulars of this controversy, it is because violent literary contention is an evil which, though, like other war, it may sometimes be unavoidable, yet is always to be regretted; and because the characters of learned, ingenious, and amiable men never appear to less advantage than under the form which that state of literary hostility obliges them to assume.

In 1778 Bishop Lowth published his last great work, *A Translation of Isaiah*. To his literary and theological abilities the translator joined the most critical knowledge of the character and spirit of eastern poetry; and accordingly the prophecies of Isaiah, which, though almost always sublime or elegant, are yet sometimes obscure, were translated in a manner adequate to the highest expectations of the public. Several occasional discourses which the bishop, by his station, was at different times called upon to deliver, were of course published, and are all worthy of their excellent author; but there is one on the kingdom of God, on the extension and progressive improvement of Christ's religion, and on the means of promoting these by the advancement of religious knowledge, by freedom of inquiry, by toleration, and mutual charity, which may be distinguished from the rest, as exhibiting a most comprehensive view of the successive states of the Christian church, and containing the truest principles of Christianity.

Of the bishop's poetical pieces, none display greater merit than verses on the Genealogy of Christ, and the Choice of Hercules, both composed very early in life. He wrote a spirited Imitation of an Ode of Horace, applied to the alarming situation of this country in 1745; and likewise some verses upon the death of Frederick, prince of Wales, with a few smaller poems.

Learning and taste, however, did not constitute Bishop Lowth's highest excellence. Eulogium itself can scarcely ascend to extravagance when speaking of him either as a private man, or as a pastor of the church of Christ. His amiable manners rendered him an ornament to his high station, whilst they endeared him to all with whom he conversed; and his zeal for the interests of true religion made him eager to advance to places of trust and dignity such clergymen as he knew were best qualified to fill them.

LOXA, a province of Colombia, in the department of Azuay, bounded on the north by Guayaquil, on the east by Jaen, on the south by Yaguarsongo, and on the west by Zamora. It is situated on an elevated and healthy situation, fertile in all kinds of grain. It affords the finest cinchona, and was long supposed to be the only place which produced that medicament in any degree of perfection. Cochineal is also found in considerable abundance. Its principal commerce consists in woven stuffs of cotton, wool, and carpet, which are held in high estimation. It possesses also two or three gold mines, which are worked. Its chief town is Loxa, situated in a beautiful and extensive valley, between two streams, which flow from the Andes. It was formerly a place of considerable importance, though now much decayed, and still contains several convents. Long. 79. 15. W. Lat. 3. 59. S.

LOYOLA, Ignatius. See Ignatius.

LOZENGE, in *Heraldry*, a four-cornered figure, resembling a pane of glass in old casements. Though all heralds agree that single ladies are to place their arms on lozenges, yet they differ with respect to the causes which gave rise to it. Plutarch says, in the life of Theseus, that in Megara, an ancient town of Greece, the tombstones under which the bodies of the Amazons lay were shaped after that form, which some conjecture to be the cause why ladies have their arms on lozenges. Petra Sancta conceives this shield to represent a *cushion*, whereupon women used to sit and spin, or do other housewifery; but Ferne thinks that it is formed from the shield called *tessera*, which the Romans, finding unfit for war, allowed to women to place their ensigns upon, with one of its angles always uppermost.

Lozenges, amongst jewellers, are common to brilliant and rose diamonds. In brilliants, they are formed by the meeting of the skill and star facets on the bezil; in the latter, by the meeting of the facets in the horizontal ribs of the crown.

Lozenge is also a form of medicine, made into small pieces, to be held or chewed in the mouth till they are melted there, and are the same with what are otherwise called *trochisci*, troches.

LOZERE, a department of the south-west of France, formed out of the district of Sevaudan, a part of ancient Languedoc. It extends in north latitude from 44. 2. to 44. 59., and in east longitude from 2. 51. to 3. 50., containing 2134 square miles, or 509,543 hectares. It is bounded on the north by the departments of the Upper Loire and Cantal, on the east by the Ardèche, on the south by the Gard, and on the west by Aveyron. It comprehends twenty-four cantons, divided into 193 communes, and contains a population of 148,000 persons, of whom the Protestants, chiefly in the arrondissement of Florac, are between thirty and forty thousand. It is a lofty, cold, raw, and hard mountain district, the most sterile and the most thinly peopled of any part of France. In the fields are to be seen rocks of granite, or of chalk, scattered about as high as the houses, whilst in the south the whole seems to be slate covered with chalk. No river runs into the department, but several streams issue from it in different directions, and form rivers, such as the Lozère, the Lot, the Allier, and the Ardèche. The climate is raw and cold, but not unhealthy. Agriculture is ill conducted, and this, with the natural poverty of the soil, causes a necessity for the importation of annual quantities of corn. No other but rye and oats, with some little barley, is raised; and chestnuts, with potatoes, form substitutes for corn with the great mass of the people, who are as ill clad as they are poorly fed. In the summer the workmen wander into the more southern departments, and even into Spain, to gain a little by their work in time of harvest. The chief branch of industry was spinning, which all practised during their long winter; but that employment has diminished by the extension of machinery. Some serges, and other coarse woollens, are, however, still manufactured. Fuel is very scarce, the woods having been ruined by neglect; and no coal is extracted. The only mineral obtained is lead, but the quantity does not exceed forty tons; and this, with some wool, hides, and cattle, forms the chief trade. The department sends one deputy to the legislative chamber. The capital is the city of Mende.

LOZOLO, a town of the province of Vercelli, in Piedmont, surrounded with several smaller places, the population of which amounts to 6450 persons, who cultivate extensively rice, and breed silk-worms.

LUBEC, an island in the Eastern Seas, which is populous, and carries on a considerable trade with Borneo and Java, off the northern coast of which it is situated. It is surrounded by a cluster of rocks and rocky islets. Long. 112. 45. E. Lat. 3. 48. S.

LUBECK, an independent republic in the north of Germany, consisting of the city of that name, a part of the town of Bergedorf, divided between Hamburg and Lubeck, and sixty-eight villages and hamlets. It extends over 148 square miles, and contains 6437 houses, and 46,508 inhabitants, who all profess the Lutheran religion, except 300 Calvinists, 400 Catholics, and 300 Jews. The income of the state amounts to L.40,000 a year, but is burdened with a heavy debt of near L.300,000. It is governed by a senate of four burgomasters and sixteen counsellors, with two syndics and a procurator, who, though the executive power, have no votes in the senate. The lower house of assembly is chosen by the twelve guilds or companies of the free burgesses. The military force amounts to about 600 men of horse and foot.

The city of Lubeck, the capital of the republic, is situated in latitude 53. 50. 22. north, and longitude 10. 41. 32. east. It stands on a gentle elevation between the rivers Trave and Wakenitz, the former of which is navigable to the Baltic Sea, which it enters at Travemund, about twelve miles below the city. It has good wide streets, with massive houses, built in a very antique style. At present it displays a picture of decay when compared with the evident signs which remain of its former prosperity. After the battle of Jena in the year 1806, Blucher, with the wreck of the Prussian army, took refuge within the walls, and were followed by the French. A battle was fought in every street, which spread horror and a degree of suffering which has never been effaced.

The French, during their possession, robbed it of all that was moveable, and the trade on which it depended disappeared in the absence of the capital with which it had been carried on. The number of dwelling-houses is 3070, but that of inhabitants does not now exceed 23,000, a striking disproportion when the size of the houses is taken into consideration. The most prominent public building is the church of the holy virgin, with a magnificent altar of black marble, a most curious astronomical clock, and two towers 400 feet in height. The Rathshouse, in which the representatives of the Hans Towns assembled, with its extensive cellars, in better times stocked with many hundred pipes of the oldest Rhenish wine, all taken away by the French, is a fine old building. There is little trade, the chief part of which consists in the conveyance of goods from Hamburg to the ports of Sweden and Russia, and bringing back the products of those countries. There are some shipowners, and about ninety vessels, great and small, belonging to the port of Lubeck. There are some small establishments for making snuff and tobacco, for refining sugar, and for other smaller manufactures.

Lubeck is remarkable for what it has been, rather than for what it now is. It was once the head of a confederacy of cities, in which the spirit of freedom and of active commerce was carried on, whilst the rest of Europe was deeply sunk in military despotism and in disgraceful indolence. At that time it was respected, feared, and its alliance courted, by the monarchs of the most powerful states; and its powerful fleets overawed the whole of the shores of the Baltic Sea. As the history of this place is curious, a few lines may be devoted to it.

It appears that in the beginning of the ninth century a tribe of Sclavonians built on the little river Schwartau a fortified place to protect themselves against another tribe called the Obotrittens. This was the ancient Lubeck. It was, however, taken and made the residence of Henry king of the Obotrittens, who continued there till 1139, when it was captured and demolished, and the present city founded on the river Trave, by Rudolph of Holstein, and peopled by fugitives from Westphalia and the Netherlands. In the year 1158 it was transferred to Henry the Lion, duke of Saxony, who granted to the city those privileges which it long enjoyed, and which were gradually assumed by the other cities which had acquired independence. Their naval power then rose rapidly; and a war having broke out between the emperor of Germany and Henry, the citizens maintained the cause of the latter with so much resolution, that, though attacked, they only submitted in consequence of a treaty which insured to them all the rights and privileges they had previously enjoyed. The possession of the city then became an object of contest between Saxony, Holstein, and Denmark, by the last of which, in 1201, Lubeck was captured; but at length, in 1226, it threw itself under the protection of the empire, when Frederick the Second affirmed its freedom, and instated it as an imperial city, with all the privileges of an independent member of the Germanic body.

In 1241 the first alliance was formed with Hamburg, and in 1260 Bremen and other free cities had become members of the confederacy, of which Lubeck was declared the head, and the place of assembly of the whole representatives. This commenced the flourishing period of its existence, which long continued, till all the cities, excepting Lubeck, Hamburg, Bremen, and Frankfort, had been one after another subjugated, and united to the dominions of the several princes by whom they were surrounded. This had taken place towards the end of the sixteenth century, when the trade of Lubeck took another direction; and this place, though nominally the head of the remaining confederacy, was the poorest and least populous of any of them. In 1802, when so many German states lost their independence, Lubeck still nominally retained hers, till she fell under the French yoke in the year 1806. In 1810 Lubeck was formed into a portion of the French department of the Mouths of the Elbe, of which Hamburg was declared the capital. After the victory of Leipzig in 1813 its freedom was restored, and afterwards secured by the congress of Vienna in 1815. The restoration of its ancient power is now hopeless.

LUBIENIETSKI, Stanislaus, a Polish gentleman, descended from a noble family, and born at Cracow in the year 1623, was educated by his father with great attention. He became a celebrated Socinian minister, and took great pains to obtain a toleration from the German princes for his Socinian brethren. His labours, however, were ineffectual, and he was himself persecuted by the Lutheran ministers, and driven from place to place, until at length he was, along with his two daughters, banished out of the world by poison, his wife narrowly escaping, in 1675. He wrote a History of the Reformation in Poland, a Treatise on Comets, and some other works, in Latin.

LUBIN, Eilhard, was professor of poetry in the uni versity of Rostock in 1595, and ten years afterwards he was promoted to the professorship of divinity. He wrote notes upon Anacreon, Juvenal, Persius, and several other classics; but that which attracted the most notice was a treatise on the nature and origin of evil, entitled *Phosphorus de Causa prima et Natura Mali*, printed at Rostock in 1596, in which we find a curious hypothesis to account for the origin of moral evil. He supposed two coeternal principles, not matter and vacuum, as Epicurus did, but God, and *Nihilum*, or Nothing. This hypothesis being attacked by Grawer, was defended by Lubin; but, after all, he is deemed to have been better acquainted with polite literature than with divinity. He died in 1621.

LUBLIN, a province of Poland, on the right bank of the Vistula. It extends in north latitude from 50. 17. to 51. 43. and in east longitude from 21. 48. to 24. 2. It contains 7979 square miles, and 497,500 inhabitants. The Vistula is the boundary to the west, and the Bug divides it from Russia on the east. It has very extensive woods and some large marshes, but there are portions of considerable fertility. The capital is a city of the same name, situated on the river Bystryzca, the seat of a Catholic bishop, and, besides a cathedral, contains eighteen churches, a monastery, a college, 1829 houses, and 10,360 inhabitants. It has some manufactures of cloth and linen, and considerable trade during the fairs, one of which continues a month. Long. 23. 27. E. Lat. 51. 14. 30. N.

LUBNI, a circle of the Russian province of Pultowa, extending in north latitude from 48. 55. to 50. 27., and in east longitude from 32. 39. to 33. 33. The capital is the city of the same name, situated on the river Sula, 920 miles from St Petersburg. It is an open city, with three churches, a monastery, a veterinary college, 1000 houses, and 6130 inhabitants. Long. 32. 45. 25. E. Lat. 50. 0. 30. N.

LUC, JOHN ANDREW DE, a natural philosopher of great merit and celebrity, born at Geneva on the 8th of February 1727, was the son of James Francis de Luc, descended from a family which had emigrated from Lucca and settled at Geneva in the fifteenth century.

His father was the author of some very respectable publications in refutation of Mandeville and other sceptical writers; and he had the means of giving his son an excellent education, although he found it convenient to establish him in a commercial engagement, which principally occupied the first forty-six years of his life, without any other interruption than that which was occasioned by some journeys of business into the neighbouring countries, and a few scientific excursions among the Alps. During these, however, he collected by degrees, in conjunction with his brother William Antony, a splendid museum of mineralogy, and of natural history in general, which is still preserved at Geneva by the younger Deluc, his nephew. He at the same time took his share of the public business of the state, as one of the council of Two Hundred; and he is still remembered with respect by his fellow citizens, though he revisited them but once, and that for a few days only after his emigration, which was the consequence of some unexpected misfortunes in commerce. He bore them with fortitude, and he rather rejoiced than lamented at the change of his pursuits, when he removed to England in 1773. He was made a fellow of the Royal Society in the same year, and was appointed reader to the queen; a situation which he continued to hold for forty-four years, and which afforded him both leisure and a competent income. In the latter part of his life he obtained leave to perform several tours in Switzerland, France, Holland, and Germany. In this last country he passed six years, from 1798 to 1804; and after his return he undertook a geological tour through England. When he was at Göttingen, in the beginning of his German tour, he received the compliment of being appointed honorary professor of geology in that university; but he never entered upon the active duties of a professorship. He was also a correspondent of the Academy of Sciences at Paris, and a member of several other scientific associations.

His favourite studies were geology and meteorology. The situation of his native country had naturally led him to contemplate the peculiarities of the earth's structure, and the properties of the atmosphere, as particularly displayed in mountainous countries, and as subservient to the measurement of heights. He inherited from his father a sincere veneration for the doctrines of Christianity, and a disposition to defend the Mosaic account of the creation, against the prevailing incredulity of the age. His royal patroness was most anxious to encourage and promote his labours in this field; and he is universally allowed to have had great success in removing the specious objections which had been advanced by his antagonists, against the comparatively recent formation of the present continents. The testimony of Cuvier is sufficient to establish his character in this capacity, and to place him, at the same time, in the first rank of modern geologists. His original experiments relating to meteorology are, however, not less valuable to the natural philosopher; and he discovered many facts of considerable importance relating to heat and moisture. He noticed the disappearance of heat in the thawing of ice, about the same time that Black founded on it his ingenious hypothesis of latent heat. He ascertained that water was more dense about forty degrees of Fahrenheit than at the temperature of freezing, expanding equally on each side of the maximum; and he was the original author of the opinion since re-advanced by Mr Dalton, that the quantity of aqueous vapour contained in any space is independent of the presence or density of the air, or of any other elastic fluid; though it appears difficult to reconcile this opinion with some of the experiments of our author's great rival, Saussure, a philosopher who, as he very candidly allows, made, in many respects, more rapid progress in hygrometry than himself. Deluc's comparative experiments on his own hygrometer, and on Saussure's, show only that both are imperfect; but it may be inferred from them, that a mean between both would in general approach much nearer to the natural scale than either taken separately. It appears also probable that Saussure's is rather less injured by time than Deluc's, which has been found to indicate a greater degree of mean moisture every year than the last.

Deluc was a man of warm feelings, and of gentle and obliging manners, fulfilling on all occasions the various duties of a husband, a father, a master, and a friend; at the same time that his literary and scientific merits, and his unremitting attention to the service of the queen, insured her respect and her kindness. He saw her daily for many years, and in his last illness, which was long and painful, she showed him repeated marks of benevolent regard. He died at Windsor on the 7th of November 1817, leaving a variety of works, which will long be remembered in the scientific world.

1. Recherches sur les modifications de l'Atmosphère, 2 vols. 4to, Geneva, 1772; 4 vols. 8vo, Par. 1784. This contains many accurate and ingenious experiments upon moisture, evaporation, and the indications of hygrometers and thermometers, applied to the barometer employed in the measurement of the height of mountains.

2. Relation de différens Voyages dans les Alpes de Faucigny, 12mo, Maestricht, 1771. This relation was written principally by Dentand, who accompanied the two Delucs in these expeditions.

3. Account of a new Hygrometer, *Phil. Trans.* 1773, p. 404. Like a mercurial thermometer, with an ivory bulb,

which expanded by moisture, and caused the mercury to descend.

4. Rules for measuring Heights by the Barometer, *Phil. Trans.* 1771, p. 158. The first correct rules that had been made public.

5. Barometrical observations on the depth of the mines in the Harz, *Phil. Trans.* 1777, p. 401. Examples of the application of the rules.

6. An Essay on Pyrometry and Areometry, *Phil. Trans.* 1778, p. 419. A paper containing many valuable remarks on physical measures in general.

7. Lettres physiques et morales sur l'Histoire de la Terre, 6 vols. 8vo, Hague, 1778. Dedicated to the queen; relating particularly to the appearances of mountains, and to the antiquity of the human race; explaining the six days of the Mosaic creation as so many periods preceding the epoch of the actual state of the globe; and attributing the Deluge to the filling up of cavities supposed to have been left void in the interior of the earth. The whole work is intermixed with interesting observations on men and manners.

8. A second paper concerning some Barometrical Measurements in the Mines of the Harz, *Phil. Trans.* 1779, p. 485.

9. Lettres sur quelques parties de la Suisse, 8vo, 1781. Also addressed to the queen.

10. Nouvelles idées sur la Météorologie, 2 vols. in 3, 8vo, Lond. 1787. A very valuable collection of observations and experiments, including some original remarks on electricity.

11. Several papers on Hygrometry, on Vapour, and Rain, on Meteorology in general, on Expansion, and on Refraction, in Rosier's *Journal de Physique*, xxx. xxxii. xxxvi. xxxvii. xliii.

12. Some letters on the physical History of the Earth, in the *Monthly Review*, enlarged, especially June 1790, and vol. ii. appendix.

13. On Hygrometry, *Phil. Trans.* 1791, p. 1, 389. In one of these very important papers the whalebone hygrometer is described.

14. On Evaporation, *Phil. Trans.* 1792, p. 400. Amongst the fundamental principles laid down in this paper, the independence of vapour and air is asserted.

15. Lettres sur l'Histoire physique de la Terre, 8vo, Par. 1798. Addressed to Professor Blumenbach, and published by Mr Emery, a clergyman, at Paris. The substance had already appeared in the *Journal de Physique*, for 1790, 1791, and 1798. We find in this volume an essay written for a prize at Haarlem in 1791, but without success, on the existence of a General Principle of Morality. It contains an interesting account of some conversations of the author with Voltaire and Rousseau.

16. Lettres sur l'Education religieuse de l'Enfance, 8vo, Berlin, 1799.

17. Bacon tel qu'il est, 8vo, Berlin, 1800. Showing the bad faith of the French translator, who had omitted many passages favourable to revealed religion.

18. Précis de la Philosophie de Bacon, 2 vols. 8vo, Paris, 1802. Giving an interesting view of the progress of natural science.

19. Lettres sur le Christianisme, Berlin and Hanover, 1801, 1803. A correspondence with Mr Teller.

20. Introduction à la Physique terrêstre par les Fluides expansibles, 8vo, Par. 1803.

21. Traité élémentaire sur le Fluide Galvanique, 8vo, Paris, 1804.

22. A paper on Lavas, *Journal des Mines*, cxv. Nicholson, xx.

23, 24. Several articles in the *British Critic* and in the *Monthly Magazine.*

25. Traité élémentaire de Géologie, 8vo, Paris, 1809; also in English, by Delafite, the same year. This volume is less strictly introductory to geology than the *Lettres sur la Terre.* It is principally intended as a refutation of the Vulcanian system of Hutton and Playfair, who deduced the changes of the earth's structure from the operation of fire, and attributed a higher antiquity to the present state of the continents than is required in the Neptunian system adopted by Deluc after Dolomieu.

26. He sent to the Royal Society, in 1809, a long paper on separating the chemical from the electrical effects of the pile, with a description of the electric column and aërial electroscope, in which he advanced opinions so little in unison with the latest discoveries of the day, especially with those of the president of the society, that the council probably thought it would be either encouraging error or leading to controversy to admit them into the *Transactions.* He had, indeed, on other occasions shown somewhat too much scepticism in the rejection of new facts; and he had never been convinced even of Mr Cavendish's all-important discovery of the composition of water. The paper was afterwards published in Nicholson's *Journal* (xxvi.), and the dry column described in it was constructed by various experimental philosophers. It exhibited a continual vibrating motion, which was made more sensible by the sound of a little bell, struck by the pendulum at each alternation; and the vibration was more or less rapid, according to the state of the atmospherical electricity, and according to other circumstances affecting the column; but the motion ceased at last, after a continuance of several months, or perhaps years. There are also papers in volumes xxi. xxii. xxvii. xxviii. xxxii. xxxiii. and xxxv. mostly on electricity and galvanism, together with one on hygrology, a letter to Bode on comets, and a fanciful theory of the origin of the heat derived from compression. Some of them are dated from Ashfield, near Honiton, in Devonshire.

27. In the *Philosophical Magazine*, volumes xxxv. xlii. xliii. and xlv. there are also some papers on electricity and geology, especially on that of St Michael's Mount, of Vesuvius, and of Northumberland; and a note on the sympathetic vibrations of the pendulums of two clocks placed near each other.

28. Geological Travels in the north of Europe, 8vo, Lond. 1810.

29. Geological Travels in England, 2 vols. 8vo, Lond. 1811.

30. Geological Travels in Switzerland and Germany, 2 vols. 8vo, Lond. 1813.

31. An Abridgment of Geology, published in 1817, when he was in his ninetieth year, is mentioned as one of his best works; but it seems to have been only a republication or a translation of some former treatise, perhaps the *Traité Elémentaire.*

(*Philosophical Magazine*, November 1817; Monod and Weiss, in the *Biographie Universelle*, tome xxv. 8vo, Paris, 1820.) (L. L.)

LUCANAS, a province of Peru, in South America, bounded on the north by the province of Castro Vireina, on the east by Parina Cochas, and on the south and west by Camana. It is 180 miles in length, and varies from thirty-six to ninety in breadth. It is situated amongst the craggy rocks of the Cordilleras; and the temperature is very cold, but the soil is fertile. The chief grains cultivated are wheat, barley, and maize; and in the valleys fruits are grown with considerable success. It has some silver mines, which are supposed to be the richest in Peru, and to which the province owes its chief importance. Its capital is a small place of the same name, situated in latitude 14. 58. south.

LUCANIA, a country of Italy, and a part of Magna Græcia, being bounded on the north by the river Silarus, by which it was separated from the Picentini, and by the river Bradanus, by which it was parted from the Apuli Peucetii; on the south by the Laüs, which separated it from the Bruttii; on the east by the Sinus Tarentinus; and on the west by the Tuscan Sea.

LUCANUS, M. Annæus, a celebrated Latin poet, who was born at Corduba, now Cordova, a city of Bætica, the southern province of Spain, A. D. 38, the year after the accession of the Emperor Caligula. He was the son of Annæus Mela, a Roman knight of considerable reputation, and the brother of the philosopher Seneca. The young Lucan, educated at Rome in the doctrines of the Stoic philosophy by Annæus Cornutus, displayed at an early age great poetical talents. His uncle Seneca, the preceptor of Nero, made him acquainted with that prince, who, admiring his nume-ous acquirements, raised him to the quæstorship before the usual age, loaded him with favours, and even honoured him so far as to enter the lists of literary competition against him. Lucan sung the descent of Orpheus to the infernal regions, Nero the metamorphosis of Niobe; and it is said that Lucan, forgetful of his duties as a courtier, carried off the palm of victory, and thereby lost the favour of the emperor (Stat. *Silv.* ii. 7, 58). It is impossible to fix the period when he composed those adulatory verses which disgrace the beginning of the Pharsalia; but, from their disgusting servility, we might be inclined to suppose that they were addressed to a tyrant who was well known and feared. According to an ancient tradition, one of these verses had already prepared the emperor to take umbrage at any thing that had the appearance of an insult. Nero uinted, and was deeply offended at the verse,

> Unde tuam videas obliquo sidere Romam.

All these various circumstances excited the wrath of the tyrant; and when Lucan, having composed a poem on the burning of Troy and on that of Rome, requested permission to read it at the public theatre, according to the custom of those times, this favour was denied him. Such persecution irritated the poet, and induced him to join a conspiracy against the emperor, which was composed of all the best citizens of Rome. It was, however, discovered before it could be carried into execution; and many of the conspirators were arrested and put to the torture. It is said that Lucan, on promise of his life, denounced his associates, and was base enough even to name his own mother.

Such conduct, however, does not appear to have procured for him forgiveness, as the only favour granted was the choice of his mode of death. In his last moments Lucan recovered his firmness of mind, and, opening his veins in a warm bath, allowed himself to bleed to death, whilst he is said to have repeated his own description (*Pharsalia*, iii. 637) of the death-scene of a young warrior who has been wounded by a serpent.

> Scinditur avulsus; ruptis cadit undique venis,
> Discursusque animæ diversa in membra meantis
> Interceptus aquis. Nullius vita perempti
> Est tanta dimissa via. Pars ultima trunci
> Tradidit in letum vacuos vitalibus artus.

He died at the age of twenty-seven, in the year 65 of our era, leaving a wife, Polla Argentaria, one of the most remarkable women of her time (Tacit. *Ann.* xv. 49, 56, 71; Sidon. Apollinar. ii. Ep. 10).

Lucan was the author of many works which have not come down to us, particularly the Burning of Troy, the Burning of Rome, the Descent of Æneas to the Infernal Regions, Ten books of Sylvæ, Medeia an imperfect tragedy and Epistles, one of which, in praise of Calpurnius Piso, has been preserved; but the work for which he is most celebrated is his poem entitled *Pharsalia*, in ten books, which he did not live to finish. The subject of the poem is the war between Cæsar and Pompey, from its commencement to the siege of Alexandria. Lucan adheres closely to chronological order in his narrative, and scarcely deviates from historical truth in his account of the various transactions. From the little scope he allows to his imaginative powers, some critics have thought that Lucan should not be considered as an epic poet, but ranked amongst historians. His poetical merits have in all ages been fiercely contested; some considering him equal to Virgil and Ovid, whilst others have placed him in the lowest rank of poets. The judgment of posterity, however, is without appeal, and it has long stamped the character of the poem as cold and declamatory, notwithstanding that there are many passages full of genuine poetry. The style is by no means uniform, and even the political sentiments of the author vary in different parts of the work. In the first three books his love of freedom is scarcely to be discovered, and every opinion is suppressed which was likely to have offended Nero. In the remainder of the poem, as his hatred increased against Nero, we can trace his aspirations after freedom gradually growing stronger. There seems no good reason for believing that the poet had any great moral end in view, except perhaps that he wished to excite in the breasts of his countrymen a love of freedom, by exhibiting before their eyes the last contest which their ancestors had maintained in its defence. He wished also, perhaps, like the historian Livy, to forget the fearful images of the present, by occupying his mind with, and dwelling on, the past. His want of a glowing imagination and of inventive genius is somewhat counterbalanced by powerful and energetic language, by a disdain of every thing that is mean or grovelling, and by noble thoughts, which are uttered with all the dignified seriousness of a Stoic. There are many editions of this work, but one of the best is that of Burmann (Leyden, 1740), and the last is that by C. F. Weber, in 3 vols., the last of which contains some valuable scholia (Leipzig, 1828).

LUCAR, St, de Barrameda, an unwalled Spanish city, at the mouth of the Guadalquiver, in the province of Seville, with 5000 inhabitants, one silk and two hat manufactories, and one tannery.

Lucar, St, de Guadiana, a Spanish fortified city on the Guadiana, in the province of Seville, with 2800 inhabitants, and a good haven, whence steam-boats now pass constantly to Seville.

LUCARIA, a feast celebrated at Rome on the 18th of July, in memory of the flight of the Romans into a great wood, where they found an asylum, and saved themselves from destruction. This wood, in which they found protection, was situated between the Tiber and the *Via Salaria.* The enemies from whom the Romans fled were the Gauls. On this festival Plutarch tells us that it was customary to pay the actors, and such as contributed to the public amusement, with the money arising from the felling of wood; and this money was called *lucar.* It is obvious, from what has been observed, that *lucar* and *lucaria* are derived from *lucus*, a grove.

LUCAS Jacobs, an eminent artist, and more generally known by the name of *Lucas van Leyden*, was born at Leyden in 1494. He received his first instructions in the art of painting from his father Hugues Jacobs, but completed his studies in the school of Cornelius Engelbrecht. He gained much money by his profession; and being of a generous turn of mind, he spent it freely, dressed well, and lived in a superior style. It is said that a few years before his death he made a tour in Zealand and Brabant; and that, during his journey, a painter of Flushing, envious of his great abilities, gave him poison at an entertainment, which, though very slow in its operation, proved fatal in its effect, and put an end to his life, after languishing six years under its cruel influence. Others deny the story of the poison, and attribute his death to his incessant industry. The superiority of this artist's genius manifested itself in his infancy; for his works, even from the age of nine, were so excellent, as to excite the admiration of all contemporary artists; and when he was about fifteen, he painted a St Hubert which gained him great applause. His tone of colouring is good; his attitudes, making allowance for the stiff German taste, are well chosen; his figures have considerable expression in their faces, and his pictures are very highly finished. In the town-hall at Leyden, the most capital picture of Lucas, the subject of which is the Last Judgment, has been preserved with great care; the magistrates having refused very large sums which have been offered for it. This artist painted not only in oil, but also in distemper and upon glass. Nor was he less eminent for his engraving than for his painting. He carried on a familiar and friendly correspondence with Albert Durer, who was his contemporary; and it is said, that as regularly as Albert Durer published one print, Lucas published another, without the least jealousy on either side, or any wish to depreciate each other's merit. His style of engraving, however, according to Mr Strutt, differed considerably from that of Albert Durer, and seems evidently to have been founded upon the works of Israel van Mechlen. His prints are very neat and clear, but without any powerful effect. The strokes are as fine and delicate upon the objects in the front as upon those in the distances; and this want of variety, joined with the feebleness of the masses of shadow, give to his engravings, with all their neatness, an unfinished appearance, much unlike the firm substantial effects which we find in the works of Albert Durer. He was very attentive to the minutiæ of his art. Every thing is carefully made out in his prints, and no part of them is neglected. He gave great character and expression to the heads of his figures; but on examination of his works we find the same heads too often repeated. He engraved upon wood as well as upon copper, but his works on the former are by no means numerous. They are, however, very spirited, though, upon the whole, not equal to those of his friend Albert. The prints of this master are pretty numerous, but very seldom met with complete, especially fine impressions of them; for though they are, generally speaking, executed with the graver only, yet, from the delicacy of the execution, they soon suffered in the printing.

Lucas, *Richard*, a learned English divine, was born in 1648, and studied at Oxford, after which he entered into holy orders, and was for some time master of the free school at Abergavenny. Being esteemed an excellent preacher, he became vicar of St Stephen's, Coleman Street, London, and lecturer of St Olave's, in Southwark. He was created doctor of divinity, and in 1696 installed prebendary of Westminster. His sight began to fail in his youth, and he totally lost it in his more advanced age. He was greatly esteemed for his piety and learning, and published several works, particularly, 1. Practical Christianity; 2. An Inquiry after Happiness; 3. Several sermons; and, 4. A Latin translation of the Whole Duty of Man. He died in 1715.

LUCCA, a dukedom in Italy, extending in north latitude from 43. 46. to 44. 14., and in east longitude from 10. 3. to 10. 44. It has enclosed within it a small portion of Tuscany, and has the communes of Menuciano, Albiano, and Renzano separated from it, between the territories of Modena and Tuscany. It comprehends 440 square miles, with one city and 290 towns and villages, which are inhabited by 150,000 persons, being the most dense population of any state in Europe. It is bounded on the north by Modena and Tuscany, on the east and the south by Tuscany, and on the west by the Mediterranean Sea. The Apennines form the northern part of the duchy, and extend from Monte Guiliano to the sea, gradually declining in height as they proceed to the westward. The other parts are level, and of high fertility. The river Serchio is the only considerable stream, and, by the numerous canals connected with it and employed in irrigation, is one of the chief causes of the great power of production which the soil displays. The agriculture of Lucca is most admirably conducted. The plains and valleys appear like gardens, in which corn and pulse fields are intermingled with olive plantations and fruit trees. The hedges are filled with elm, mulberry, and other trees, around which the vines are to be seen clustering in elegant festoons. Along the shore are rich meadows, on which numerous horned cattle are fed, whilst near them other fields exhibit most abundant crops of rice. Even the mountains almost to the summits are covered with vines, or with olive, chestnut, and mulberry trees; and the Apennines themselves produce chestnuts, as well as the finest pines and larches. Notwithstanding the application of all the labour to agriculture, the duchy does not produce corn equal to the consumption, but receives it from the other states in exchange for the oil and silk, which is abundantly obtained. As the kind of agriculture practised engages all the labour, scarcely any of it is directed towards manufactures; and even the silk, except that used for internal purposes, is not organized, but is exported in the raw state. The executive government of Lucca was conferred, by the congress of Vienna, on the Empress Maria Louisa, the wife of Napoleon. The power of making laws is intrusted to a senate of thirty-six members, who meet for a month every year. The revenue of the duchy is from L.60,000 to L.70,000 annually, of which the civil list of the regent is L.12,000. The military force is composed of from 1000 to 1200 men. The capital is the city of the same name, situated on the canal of Ozzorti, which joins the river Serchio. It is walled, and contains the palace of the regent, an old Gothic cathedral, a university, and some other institutions for education, three hospitals, and 17,450 inhabitants. There are some respectable manufacturers of woollen cloths and casimeres. The environs are adorned by many villas, and are cultivated with the minute attention which is usually paid to gardening. Long. 10. 12. E. Lat. 43. 49. N.

LUCERA, a city of the province Capitanata, in the kingdom of Naples. It is situated on a hill on the edge of the plain of Puglia, is surrounded with walls, and is the see of a bishop. The cathedral is supported by fourteen beautiful marble columns. It has twelve other churches, several convents, and 8325 inhabitants.

LUCERES, in Roman antiquity, the third in order of the three tribes into which Romulus divided the people, including all foreigners, and so called from the *lucus* or grove where Romulus opened an asylum.

LUCERIUS, in *Mythology*, a name given to Jupiter, as *Luceria* was given to Juno, these being considered as the deities who gave light to the world.

LUCERNA, one of the valleys of Piedmont, which is inhabited by the Vaudois. The capital, of the same name, is situated on the river Pellice, and contains about 1100 inhabitants. The whole valley has a population of 12,000, who adhere to the faith of their ancestors, who separated from the Roman Catholic church several centuries before the reformation of Luther.

LUCERNE, a canton in the centre of Switzerland, being surrounded by Arau, Schweitz, Unterwalden, Zug, and Berne. It is 792 square miles in extent. The southern part is covered with a portion of the lofty Alps, but the whole is elevated, the lake of the four forest cantons being 1320 feet above the level of the sea. There are, however, some extensive plains, with well-cultivated fields, which produce corn, potatoes, and, from the dairies, a great deal of butter and cheese. It is one of the cantons which produce more food than they consume. It is a highly picturesque country, from the height of its mountains and the rapidity and clearness of its streams. The inhabitants amount to about 100,000, chiefly adhering to the Romish church. A great portion of the land belongs to the church and other corporate bodies. The taxes to the state are lower than in the other cantons. The constitution is that of an aristocratic republic, with a senate composed of sixty-four members chosen for life, and thirty-six for a shorter period. The canton is divided into three bailiwicks. The capital, of the same name, is built at the efflux of the river Reuss from the lake of the four forest cantons, or of Lucerne. It is surrounded with walls and towers, and contains five churches, two convents for men and two for females, 620 houses, and 5000 inhabitants. It has a lyceum, a gymnasium, and other schools. The inhabitants are active manufacturers of hats and hosiery, of printed calicoes, of leather, beer, vinegar, and some smaller articles, and carry on the chief trade of the canton, by means of which wine, sugar, coffee, and other foreign articles are disposed of. Long. 0. 13. 15. E. Lat. 47. 3. 27. N.

LUCIA, St, one of the Caribbee Islands, in the West Indies, situated in latitude 13. 37. north, and longitude 60. 58. west. It is about thirty-two miles in length and twelve in breadth, and is divided longitudinally by a ridge of lofty hills, from 1200 to 1800 feet in height, clothed with the finest timber. Its appearance from the sea is very striking, presenting great diversity of scenery. At its southern extremity are two mountains of volcanic origin, called the Sugar Loaves, which rise perpendicularly from the sea to a great height, in the form of parallel cones, tapering towards the summits. They are covered with evergreen foliage, and form the entrance into a small but deep and beautiful bay. The mountains, which run north and south throughout the island, are of volcanic formation, and assume the most fantastic shapes, abounding in deep chasms and pointed eminences. They are completely covered with wood, which attracts the clouds, and the island is consequently deluged with rain nine months out of the twelve. This is the reason why the climate is so unhealthy; but it will become less so in proportion as the woods are cut down, and the morasses and stagnant waters drained off. At the foot of the mountains there are numerous small lakes, in which the water is perpetually boiling, and in some places the ebullition is so violent that the water is thrown up to the height of four or five feet. The valleys throughout the island, as well as the plains upon the coast, are fertile, and under good cultivation, being well watered by numerous rivulets. The island is divided into two territories; Basseterre, the low or leeward territory, which is well cultivated, and the most populous, though the prevalence of stagnant waters and morasses renders the climate very unhealthy; and Capisterre, the high or windward territory, which is also very unhealthy, but is becoming less so as the wood on the high lands is cleared away. These territories are divided into three districts, which are again subdivided into ten parishes, the aggregate population of which, in 1832, amounted to 22,743. The inhabitants are, for the most part, engaged in agricultural pursuits. The principal stock in the island consists of 676 horses, 2421 horned cattle, 1616 sheep, and 765 goats.

This general description will be better understood from the following statistical tables, relative to the population, the produce, the shipping attached to the island, and the number of seamen employed.

Return of the Free Population, Births, Marriages, and Deaths, in the year 1832.

Whites.		Free Blacks.		Aliens and Resident Strangers.	Persons employed in			Births.	Marriages.	Deaths.
Males.	Females.	Males.	Females.		Agriculture.	Manufactures.	Commerce.			
433	433	1297	1531	45	4177	1414	65	423	16	307

Return of the Number of Slaves at the Registration of 1832, *distinguishing the Sexes; also the Number added on Account of Birth, or taken off on Account of Death or Manumission.*

Number in the Registry.			Increase by Births.			Decrease by Death.			Decrease by Manumission.		
Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
6119	7229	13,348	581	549	1130	573	475	1048	151	215	366

Statement of the Amount of West India Compensation to be paid, with the Number of Slaves in 1832, *showing the decrease since* 1829, *with the per centage lost, &c.*

Number of Slaves in 1832 on which Compensation is to be paid.	Decrease of Slaves in Five Years.	Per Centage Lost.	Average Value of the Slaves from 1822 to 1830 inclusive.			Proportion of the L.20,000,000 St Lucia will receive.			Average Value of each Slave from 1822 to 1830 inclusive.		
			L.	*s.*	*d.*	*L.*	*s.*	*d.*	*L.*	*s.*	*d.*
13,348	313	2¼	759,890	10	4	335,627	16	11¾	56	18	7

Return of the Produce, &c. in 1832.

Crops.								Produce.				
Nature of the Crops, and Number of Acres of Land in each Crop.								Nature of the Produce, and Quantity of each.				
Canes.	Coffee.	Cocoa.	Cotton.	Provisions.	Pastures.	Total Number of Acres in Crop.	Number of Acres of Uncultivated Land.	Sugar.	Coffee.	Cocoa.	Rum.	Molasses.
Acres.	Acres.	Acres.	Acres.	Acres.	Acres.			lbs.	lbs.	lbs.	Gallons.	Gallons.
3641½	407⅓	176	14	2964	4286¾	11,489½	21,313¾	5,061,500	87,520	26,277	67,202	135,692

From this return, it appears that the number of acres in the island is 32,803¼; but, as the upper part of the hilly country has not been taken into account, the total number cannot be less than 37,500 acres.

The Shipping attached to the Island, and the Number of Seamen employed, are as follows.

Places.	Inward.			Outward.		
	Ships.	Tons.	Men.	Ships.	Tons.	Men.
Great Britain	11	2,443		11	2,518	
British colonies	124	5,250		131	6,903	
United States	17	2,056		15	1,731	
Foreign States	230	6,194		284	7,294	
Total	382	15,943	2,106	441	18,446	2,433

The value of the merchandise imported into the colony in 1832 was L.35,958, and the exports from it the same year amounted to L.51,126. The authorized coins in circulation are British, Spanish, and French. The weights in use are the French pound and quintal.

The taxation, which amounts to nearly L.10,000, falls very heavily on the producers, and is much complained of.

St Lucia was first settled by the English about the year 1635, and belonged alternately to France and England, till 1803, when it was finally captured by the English. The white inhabitants are generally French, who profess the religion, speak the language, and possess the manners of that country, but who maintain little intercourse with the English residents. Their affairs are administered by a governor and council, with French laws where these are not adverse to the British.

The only town in the island is Castries, which is situated in a long and winding bay of the same name. It is a small, mean place, and very unhealthy, but possesses an excellent harbour. The fort is situated about two miles from the town, on the summit of a hill called Mornefortune. On the west coast there is an excellent harbour called the Little Careenage, accessible at the entrance to only one vessel at a time, but capable within of containing thirty ships of the line. Nearly six miles from the harbour of St Lucia, is a small island called Pigeon Island, about half a mile long and a quarter broad. It is of some importance as a military station, from its commanding a view of every ship which enters or departs from the adjacent island of Martinique. It is, moreover, valuable for a very fine and extensive anchorage between it and the northern part of St Lucia. The climate is the most salubrious in that quarter.

Lucia, *St*, a city of the island of Sicily, in the kingdom of Naples, situated on a river of the same name in the province of Demone, 190 miles from Palermo. It is in a healthy situation, on the declivity of the mountain Dinnamane, and contains 6000 inhabitants.

LUCIANISTS, or **Lucanists**, a religious sect, so called from Lucianus, or Lucanus, a heretic of the second century, and a disciple of Marcion, whose errors he followed, adding to them some new ones of his own. But Epiphanius says he abandoned Marcion, teaching that people ought not to marry, for fear of enriching the Creator; and yet other authors mention that he held this error in common with Marcion and other Gnostics. He denied the immortality of the soul, asserting that it was material, and consequently dissoluble. There was another sect of Lucianists, who appeared some time after the Arians, and who taught that the Father had always been a father, and that he had the name even before he begot the Son, as having in him the power or faculty of generation. In this manner they accounted for, or rather impugned, the eternity of the Son.

LUCIANUS, a celebrated Greek writer, was born at Samosata, the chief city of Commagene, a district situated upon the right bank of the river Euphrates. The precise dates of his birth and death are unknown; but it seems to be generally allowed that he flourished during the reign of the Antonines and of Commodus. Reitz, who has examined this point with much minuteness, makes his life extend between the years 120 and 200 of our era. His own writings supply us with what scanty information we have respecting his private history. His parents, he tells us, were poor, and found it necessary that their son should at an early period choose the profession by which he was to gain his livelihood. His maternal uncle was a sculptor of some fame at Samosata, and was willing to teach his nephew his own profession; but the youth having contrived awkwardly to break a marble slab which he was set to polish, received a severe beating from his cross-grained uncle. Lucian refused to submit to such treatment, and gave up all thoughts of succeeding to the lucrative business of his uncle. He then turned his attention to a more liberal profession, and devoted himself to the study of law; but becoming disgusted with the chicanery and deceit of which he was obliged to be cognisant, he abandoned his new profession, and applied himself to philosophy. He then visited the different parts of the civilized world; he resided several years in Gaul and in Italy, of which he gives an account in his treatises entitled *Nigrinus*, but chiefly in Athens, where he became thoroughly master of the Greek language. It is believed, from incidents mentioned in *Nigrinus* and *Hermotimus*, that Lucian approached his fortieth year when he left Gaul, where he appears to have resided from ten to fifteen years. Massieu imagines that he returned to Samosata, and remained in his native place till Marcus Aurelius conferred upon him a lucrative situation in Egypt. Wieland, however, who examined this part of his life minutely, gives satisfactory reasons for believing that he spent most of his time at Athens, where he composed the greater part of his finest dialogues. He was certainly resident in Greece A. D. 165, where he witnessed the self-sacrifice of the enthusiast Peregrinus Proteus on the funeral pile, during the celebration of the Olympic games. He spent the latter part of his life in Egypt, but he does not state the precise nature of the office which he filled in that country.

Lucian is distinguished as a writer for fertility of genius, wit, taste, and elegance, and for the talent of conferring the grace of novelty upon the most common and familiar topics. Notwithstanding the great change in customs and manners, after a lapse of seventeen hundred years, the wit of Lucian is still amusing, his satire still applicable, and his pictures of manners still fresh and vivid. It must be confessed that he sometimes exceeds reasonable bounds whilst he ridicules the absurd superstitions of his countrymen, and laughs at the mountebanks who were decked out with the name of philosophers. Whilst he merely intends to attack superstition, he is often so carried away by his wit as to ridicule all religious sentiments. He strikes at the very foundation of morality; and the blows which he aims at the hypocrites amongst philosophers, sometimes fall on the good and virtuous. In depicting the manners of the vicious, he is at times obscene and licentious. Amongst the most spirited of his works we may mention, the *Dialogues of the Gods*, in which Lucian makes the gods converse, as it were, in their domestic capacity and undress, and in moments of weakness, when, not being aware that they were privily overheard by men, they exposed themselves to the view of their worshippers in all their nakedness. In these dramatic scenes they show themselves, by their follies, baseness, and vices, unworthy of the esteem and confidence of mankind. *Dialogues of the Dead*, in which he ridicules with his peculiar humour the vulgar tenets respecting the state of souls after death, hell-torments, and the deification of dead persons. *Timon*, in which there is considerable resemblance to the *Plutus* of Aristophanes; the *Dream of Micyllus*, or *the Cock; Jupiter Tragœdus*, the comic title of a little drama of much wit and humour, in which Jupiter gets such serious wounds as he has never since been able to recover. *The Convicted Jupiter*, in which Lucian shows the inconsistency of the pagan doctrines concerning fate, the providence of the gods, and the rewards and punishments after death. *The Sale of the Philosophers*, in which he exposes the absurd tenets, manners, and principles of every sect. *The Angler*, or *the resuscitated Philosophers.* In the story of *Lucius*, or the *Enchanted Ass*, there are several indecent and licentious scenes, though it abounds with humour. This story has been ascribed by some to Lucius of Patræ, and there seems good reason for believing that Lucian merely abridged it; but no one has ever doubted his claim to the story entitled *The True History*, a long tissue of incredible adventures, and extraordinary voyages made in seas full of wonders. His intention was to ridicule the impostures which Etesias and Iambulus had attempted to palm upon the world as true stories. The tract entitled *How to write History* has been unanimously pronounced one of the best and most instructive of his writings. There have been numerous editions of the works of Lucian. The first was published in 1496; but the best is that of Hemsterhuys and Reitz, Amsterdam, 1743, three vols. 4to, to which is added a fourth volume, *Lexicon Lucianeum*, by Conrad Reitz, 1746. It has been translated into German by Wieland, into Italian by Gozzi, and into English by Franklin (1780), and Tooke (1820).

LUCIFER, according to the poets, was the son of Jupiter and Aurora. In astronomy, Lucifer is the planet Venus, which either goes before the sun in the morning, and is our morning star; or in the evening follows the sun, and then is called *Hesperus* or the evening star.

LUCIFERA, in *Mythology*, a surname given to Diana, under which title she was invoked by the Greek ladies in childbed. She was represented as covered with a large veil, interspersed with stars, bearing a crescent on her head, and holding in her hand a lighted flambeau.

LUCIFERIANS, a religious sect, who adhered to the schism of Lucifer, bishop of Cagliari, in the fourth century, who was banished by the Emperor Constantius for having defended the Nicene doctrine concerning the three persons in the Godhead. St Augustin seems to intimate that the Luciferians believed the soul, which they considered as of a carnal nature, to be transmitted to the children from their fathers. Theodoret says that Lucifer was the author of a new error. The Luciferians increased mightily in Gaul, Spain, Egypt, and other countries. The occasion of the schism was, that Lucifer would not allow any acts he had done to be abolished. There were only two Luciferian bishops, but a great number of priests and deacons. The Luciferians cherished a peculiar aversion to the Arians.

LUCILIUS, Caius, a Roman knight, who is generally considered as the inventor of satirical composition, at least of that new form which was adopted by Horace, Persius, and Juvenal. Of his personal history we can collect only a few facts. He was born 148 B. C. at Suessa, now *Sessa*, a city of the Aurunci, in Latium, and died at Naples at the age of forty-six, B. C. 103 (Juv. i. 20; Euseb.). He attended Scipio Africanus in the war against Numantia, B. C. 134, at an age when he could scarcely be expected to serve in arms. It was then that he acquired the friendship of the younger Scipio, and of Lælius (Vell. Pat. ii. 9). He composed thirty satires, epodes, hymns, a comedy, and a Life of Scipio the elder. His satires are frequently mentioned by ancient writers, and with great praise; but we have only a few fragments remaining. Lucilius first introduced hexameter verse, which became the usual measure of Roman satirical compositions; and made little use of the iambus or trochæus. He also excelled those who preceded him, in the sharpness of his wit and the polished smoothness of his language. Horace, however, pronounces a severe sentence on the poetry of Lucilius. He finds his verses harsh and unmusical, and compares him to a river whose waters bring down particles of gold and mud mingled together (*Sat.* i. 10). The fragments of Lucilius have been published by Douza, with learned notes, Leyden, 1597, and Amsterdam, 1661; again by Volpi, Padua, 1735. (See Bähr, *Geschichte der Romischen Literatur*, Carlsruhe, 1832.)

LUCIMETER. This name has been given to an apparatus employed by Bouguer for measuring the intensity of the light which proceeds from different bodies.

In the case of two lamps or candles burning near to each other, the intensity of the light may be compared, by comparing the intensity of the shadows of an adjacent body. The shadow produced by interposing the body in the stronger light is darker than its shadow formed by the interposition of the body in the rays of the weaker; because the first shadow is enlightened only by the light it receives from the weaker light, whilst the other shadow is more strongly enlightened by the light from the stronger light. But this method will not serve for comparing the intensity of the light of the sun and moon, for the light of the sun so greatly exceeds that of the moon, that when both are visible at the same time, the light of the moon is far too weak for any shadow to be formed by intercepting it.

For the purpose of measuring and comparing the intensity of the light of the sun and moon, Bouguer reduced the light of the sun and of the moon till the light appeared to be equal to that of a candle. The eye is able to judge whether or not two lights are equal; but if the lights are unequal, it is impossible to estimate by inspection how much the one exceeds the other. Being able to calculate how much he had reduced the light of the sun and of the moon, he was enabled to say what proportion their light bore to that of the candle.

For the former, Bouguer, when the sun was at an elevation of thirty-one degrees above the horizon, received the light into a dark room, through a hole of one twelfth of an inch in diameter. In this hole was placed a concave glass to weaken the light, by making the rays diverge more than they would in passing through the hole without a concave glass. He received the image formed by the divergent rays at a distance of five or six feet, by interposing a screen, which formed a right section of the cone of divergent rays. This right section was a round image of the sun, of $\frac{108}{12}$ of an inch in diameter; therefore the light was diminished by the square of that number, since the light received through a hole of one line in diameter was diffused over a circle of 108 lines in diameter, and of 1164 times the area. This light he found to be equal to that of a candle placed at a distance of sixteen feet.

He employed the same concave glass to receive the light of the full moon, the moon being nearly at its mean distance from the earth, and at thirty-one degrees of altitude, the same altitude as the sun had in his observations of that luminary. The light of the moon being weak, he received the image at eight twelfths of an inch from the concave glass, and then the light of the image was so weak as to be equal to the light of a candle at the distance of fifty feet.

Now the light of the moon was diminished in the proportion of the square of one to sixty-four, which is the square of the diameter of its circular image. If the light of the moon had been diminished 11,664 times, it would have been equal to the light of the candle removed to a distance of 675 feet; for as eight, the diameter of the image, is to fifty, the distance, so is 108, the diameter of the image when the light is reduced 11,664 times, to 675 feet, the distance of the candle which would produce that degree of light. Therefore the light of the sun being equal to that of a candle placed at the distance of sixteen inches, and the light of the moon being equal to the light of the same candle placed at the distance of 675 feet, that is, 8100 inches, it follows that the light of the sun is to the light of the moon as 65,610,000, the square of 8100, is to 256, the square of 16. This experiment gave the light of the sun 256,289 times greater than the light of the full moon. Bouguer obtained results somewhat different from other experiments, and taking a mean of these results, he concludes that the light of the sun is 300,000 times greater than the light of the full moon. The light of the moon, when collected into a focus by a concave mirror which condenses the light into a space 306 times less than the natural state of the light, produces no sensible heat.

Bouguer found, by a process similar to that above described, that the light of the full moon when elevated 66° 11′, was to the light of the full moon elevated 19° 16′ above the horizon, as 2500, the square of 50, to 1681, the square of 41. The sun at the harbour of Croisac in Bretagne, where Bouguer made his experiments, has the same apparent altitudes of 66° 11′, and 19° 16′ at the summer and winter solstices; and he concludes that the intensity of the light of the sun at the summer solstice is to the intensity of its light at the winter solstice, in the above-mentioned ratio of 2500 to 1651, or about three to two. He found that the light of the moon, when near the horizon, and about to set, was 2000 times less than the light of the moon elevated 66° 11′. This difference in the light of heavenly bodies when at different altitudes proceeds from the want of transparence in the air; for when the heavenly body is not much elevated above the horizon, the rays proceeding from it have a greater distance of atmosphere to pass through than the rays from the same body at a greater altitude; and the rays from a heavenly body in the zenith proceed in the direction of a diameter, and therefore traverse the atmosphere by the shortest path. Bouguer calculates that the mass of air passed through by the rays from a heavenly body at 66° 11′ is equal to a supposed mass of air of the uniform density of the air at the surface of the earth, 4275 toises in thickness; and that the mass of air passed through by the rays from a heavenly body 19° 16′ in altitude, is equal to a supposed mass of air of the density of the air at the surface, and of 11,744 toises in thickness.

He concludes that light is diminished $\frac{819}{2500}$, or about one third, by passing through a mass of air of the uniform density of the air at the surface, and 7469 toises in thickness. The rays from a heavenly body near the horizon are likewise impeded by the terrestrial vapours, which vary in density, and render the intensity of the light of a heavenly body at the horizon various at different times. The same cause renders the quantity of the refraction of the heavenly bodies at the horizon uncertain.

In certain states of the air, the discs of the sun and the moon, when at the horizon, appear somewhat elliptic, the apparent vertical diameter being less than the horizontal. This is occasioned by the greater refraction of the air through which the under limb is seen; which refraction elevates the apparent place of the under limb by a quantity sensibly greater than that quantity of refraction by which the upper limb is raised. This alteration of figure, and the colour of the rising and setting sun and moon, indicate the greater or less quantity of vapour diffused in the air, and are usefully referred to by the seaman and farmer as prognostic indications of the weather.

The existence of a greater or less quantity of vapour mixed with the air is also indicated by the different degrees of intensity of the blue colour of the sky. Some are of opinion that this colour depends on the colour of the mass of air which forms the atmosphere; others maintain that it arises from the darkness of space seen through the interposed atmosphere. The blue colour of the sky increases in intensity from the horizon to the zenith, and is particularly intense when seen from the elevated parts of the Alps, because in that situation there are few terrestrial vapours mixed with the air, and it is the white colour of these vapours which renders the blue less intense in lower situations. For the purpose of estimating and noting its intensity, it is compared with different tints of blue painted on a card, as described under the article CYANOMETER.

See *Essai d' Optique sur la Gradation de la Lumière*, par Bouguer; and *Voyage* de Humboldt, *Relation historique*, chap. iii. p. 251. (B. B.)

LUCINA, a goddess amongst the Romans, who presided over women in labour. Some take her to be Diana, and others Juno. She was called *Lucina*, because she brought children to the light; from the Latin word *lux*, light.

LUCKENWALDE, a city of the province of Brandenburg, in Prussia, situated on the river Nuthe. It contains 680 houses, and 4150 inhabitants, who are employed chiefly in making cloth, and other woollen goods.

LUCKNOW, a city of Hindustan, in the province of Oude, situated on the south bank of the river Goomty, over which there are two bridges, one a very noble Gothic edifice of stone, and the other a platform laid upon boats, and merely connecting the King's Park with the palace. The Goomty is navigable for boats of a common size at all seasons of the year, and falls into the Ganges between Benares and Gazypoor. The last sovereign, Saadut Ali, had brought over an iron bridge from England, and a place was prepared for its erection; but, on his death, his successor declined prosecuting the work, on the ground that it was unlucky; so that it is now left to be destroyed with rust. The streets where the lower classes reside consist of mean houses built of clay, "with the filthiest lanes between them," says Bishop Heber, "that I ever went through, and so narrow that we were obliged to reduce our front, and even a single elephant did not pass very easily. A swarm of beggars," he continues, in the lively description which he gives of the aspect of the town and its population, "occupied every angle, and the steps of every door, and all or nearly all the remaining population were, to my surprise, as much loaded with arms as the inhabitants of the country; a circumstance which told ill for the police of the town, but added considerably to its picturesque effect. Grave men in palanquins, counting their beads, and looking like moullahs, had all two or three sword or buckler lacqueys attending on them. People of more consequence, on their elephants, had each a retinue of shield, spear, and gun, little inferior to that by which we were surrounded; and even the lounging people of the lower ranks, in the streets and shop-doors, had their shields over their shoulders, and their swords carried in one hand." Lucknow is a very ancient city. It was formerly the residence of the governors or nabobs of Oude, but was abandoned by Shujah ad Dowleh after the battle of Buxar; on his death in 1774, however, his successor returned to it; and being now the residence of the kings of Oude, it has been greatly increased, and embellished by palaces and other public buildings; and the bankers and men of property having accompanied the court, Lucknow became one of the largest and richest towns in Hindustan. In advancing into the town, the buildings begin to improve, though the streets continue to be equally narrow and dirty. Some of the streets are, however, more spacious; and one in particular is mentioned as being both wide and handsome. From the dwelling of the British resident, all the way down the principal street, and afterwards through the park of Dil-Koushar and the neighbouring drives, Lucknow appeared to Bishop Heber to have more resemblance to some of the smaller European capitals, such as Dresden, than any other town which he had seen in India. There are several palaces in Lucknow belonging to the king, but none of them are very striking buildings. There is one close to the residency, which is merely a cluster of mean houses, with some morsels of showy architecture intermingled like the offices of a college. The minister's house is a very large pile of buildings, in a dirty part of the town. There are many stately khans, and some handsome mosques and pagodas, scattered in different corners of the most wretched alleys. The most striking buildings in Lucknow are the tombs of the late Nawab Saadut Ali and of the mother of the present king, the gate of Constantinople, and the imumbra or cathedral. The latter building consists of two courts, rising with a steep ascent one above another. It contains, besides a splendid mosque, a college for instruction in Mussulman law; apartments for the religious establishment maintained here; and a noble gallery, in the midst of which, under a brilliant tabernacle of silver, cut glass, and precious stones, lie buried the remains of its founder Asuph ud Dowlah. The whole is in a very noble style of eastern Gothic, and is distinguished by richness and variety, as well as by the just proportions and general good taste of its principal features. Close to this fine group is a large and handsome, though a dull and neglected looking pile, which is the palace or prison appropriated to the unfortunate widows and concubines of deceased sovereigns. There is a small summer palace of the king's about three miles from the city, to which there is a pleasant ride. The house is small and ugly, but the park is extensive, and it is well stocked with Indian deer, and with fine red deer. The king has also a large menagerie, containing a great number of scarce and curious animals; and, on the banks of the river Goomty, in a well wooded park, is a large collection of different varieties of cows, camels, and deer, and five or six very large rhinoceroses. Amongst the curiosities in the neighbourhood is Constantia, the residence of the late General Martin, who, from being a common soldier, rose to a high rank in the Company's army. His house is a large and whimsical building, and the grounds are laid out in the worst possible taste, displaying in the outline and arrangements the eccentric genius of the contriver. To the house is annexed a very fine garden and extensive grounds. The population of Lucknow is estimated at 300,000; and Bishop Heber is of opinion that it is sufficiently crowded to contain that number. There is in Lucknow a considerable number of European inhabitants, consisting of the numerous dependents of the residency, and those Europeans and half castes retained by the king in his employment. There are also many tradesmen amongst both these descriptions of persons, and a strange medley of adventurers of all sects and nations, who ramble thither in search of employment, which, however, they seldom find. It is 650 miles travelling distance from Calcutta, from Delhi 280, from Agra 202, and from Benares 189 miles. Long. 80. 55. E. Lat. 26. 51. N. The district of Lucknow is adjacent to the city, and is situated between the 26th and 27th degrees of N. lat. The country is generally a sandy soil, covered, after a storm, with puddles of water. Some parts, however, are more fertile and better cultivated. The country is watered by the Ganges, the Goggrah, and the Goomty; and over the small river Sye is a bridge of fifteen arches, an excellent specimen of Mahommedan architecture. The towns are mostly built of brick, and there are still in many parts extensive mounds of brick dust, the only vestiges of ancient cities. (Rennell's *Memoir of a Map of Hindustan;* Lord Valentia's *Travels,* &c.)

LUCKPUT BUNDER, a town of Hindustan, province of Cutch, situated about thirty miles up the Lory River or Salt Creek, which communicates with the Gulf of Cutch, and is only navigable for small vessels. It is defended by a fort, which is situated on the brow of a hill. It is not estimated to contain more than 2000 inhabitants, 500 of whom are Sepoys; and it is at present a place of little trade. Lat. 23. 47. N.

LUCRETIA, the famous Roman matron, wife of Collatinus, and the cause of the revolution in Rome by which the constitution of the state was changed from a monarchy to a republic. This lady being ravished by Sextus, the eldest son of Tarquin king of Rome, stabbed herself, in the year 509 before Christ. The bloody poniard, with her dead body exposed to the senate, was the signal of Roman liberty; the expulsion of the Tarquins, and the abolition of the regal dignity, were instantly resolved on, and carried into execution.

LUCRETIUS, T. CARUS, a celebrated Roman poet and philosopher, who was born B. C. 95 and died B. C. 55, according to Donatus (*Vit. Virg.*), or 52 B. C. according to Eusebius. We have no precise information respecting his parents, his education, or the circumstances of his life; and even whether he studied at Athens under Zeno is a matter of considerable doubt. We know, however, that he must have witnessed the proscriptions of Marius and Sylla, and have lived during all the horrors of the civil war, a period full of popular commotions, and crimes of the deepest dye. An ingenious writer has attempted to draw a parallel between those horrible times and the peculiar doctrines which Lucretius advocated. It is said that, not daring to attribute the misery of his country to the justice and wisdom of the gods, he was anxious to dethrone a Providence which seemed to abandon the world to the passions of ambitious tyrants. He borrowed his philosophy from the school of Epicurus, and was evidently well acquainted with the language and manners of the Greeks. His poem entitled *De Rerum Natura* is divided into six books, and addressed to his friend Memmius, one of the most virtuous and enlightened men of his age. There is a tradition that it was composed during the lucid intervals of a madness caused by a love potion which had been administered to him by his wife Lucilia. The talent of Lucretius is displayed by the skilful manner in which he treats his subject, even when its nature is such that it does not admit of poetical embellishment, and by the dignity with which he unfolds his philosophical views. He indulges but seldom in declamation, and every thing is simple and without ornament. The poet has bestowed much care upon the introductory parts of each book, and

Lucullus.

throughout the work there are many beautiful passages and episodes, such as the description of the plague at Athens. The most celebrated passages are the invocation to Venus, the powerful description of love, &c.; but, to form a just idea of his talents, we must read the fifth book, in which he narrates the formation of society. The materials for this work were taken principally from the writings of Epicurus. In the design he seems to imitate the unadorned and almost prosaic poetry of Empedocles. The language, rich in antique forms and expressions, is thus full of power and energy; but that he had many difficulties with which to contend, is proved by his complaints of the poverty of the Latin language, and by the introduction of many Greek words, which are seldom to be met with in other Roman authors. His philosophy is that of the atheist; he denies the existence of a Deity and of a Providence; he disbelieves the immortality of the soul, and laughs at the idea of death. From the depths of this heartless scepticism, however, he darts at times to the very heights of enthusiasm and poetry. But the character of his system experiences no change. He destroys all those gods with whom the poets loved to people the universe; he ridicules the idea of a future life, and of future rewards and punishments; he represses all hopes, and stifles all fear; yet all ages have admired this poem of Lucretius, as one of the most wonderful productions of human genius. It is said by Eusebius that Cicero revised and published this work, and yet it is remarkable that he only mentions Lucretius once, and then his praise is but equivocal (Cic. *ad Q. Fratr.* ii. 2). Ovid promises immortality to his verses.

Carmina sublimis tunc sunt peritura Lucreti,
Exitio terris cum dabit una dies.

There have been many editions of this work. The first edition known is in folio, without date, and appears to be that of Thomas Ferrand, printed at Brescia in 1473. The others are, Veron. 1486; Venetiis apud Aldum, 1500; cum comment. Lambini, Paris, 1564, 1570; cum notis Creech, Oxon. 1695; ed. Wakefield, Lond. 1796; ed. Eichstædt, Lips. 1801; ed. Forbiger, Lips. 1828.

LUCULLUS, Lucius Licinius, a Roman general celebrated for his eloquence, his victories, and his riches. In his youth he made a figure at the bar; but being afterwards sent as quæstor into Asia, and prætor into Africa, he governed those provinces with great moderation and justice. Scarcely was he known as a military man, when he twice defeated the fleet of Hamilcar, and gained two great victories over him. His happy genius was greatly improved by study; for he employed his leisure in reading the best authors on military affairs. Being made consul along with Aurelius Cotta, during the third war with Mithridates king of Pontus, he was sent against that prince; and this expedition was attended with a series of victories, which did him less honour than an act of generosity towards his colleague. The latter, willing to take advantage of his absence to signalize himself by some great exploit, hastened to fight Mithridates, but was defeated and shut up in Chalcedonia, where he must have perished, if Lucullus, sacrificing his resentment to the pleasure of saving a Roman citizen, had not flown to his assistance, and disengaged him. All Pontus then submitted to Lucullus, who being continued in his government of Asia, entered the territories of Tigranes, then the most powerful king in Asia. That prince marched with a formidable army against Lucullus, who defeated him with a handful of men, and killed great numbers of his forces; took Tigranocertes, the capital of his kingdom; and was ready to put an end to the war, when the intrigues of a tribune got him deposed, and Pompey nominated in his stead. Lucullus having brought home prodigious riches, now gave himself up to excessive luxury; and his table was served with a profusion and splendour until that time unknown. He brought from the East a great number of books, which he formed into a library, and gave admission to all men of learning, who frequented it in great numbers. Towards the end of his life, he fell into a kind of madness; and Lucullus, his brother, was appointed his guardian. He is said to have been the first who brought cherries into Europe, having imported the grafts from the kingdom of Pontus.

Lucus
Ludius.

LUCUS, in general, denotes a wood or grove sacred to a deity; so called *a lucendo*, because a great number of lights were usually kept burning in honour of the god, a practice common with idolaters, as we learn from Scripture.

LUD, a British king mentioned in our old chronicles, and said to have reigned about the year of the world 3878. He is reported to have enlarged and walled round *Troynovant*, or New Troy, where he kept his court, and made it his capital. The name of London is derived from *Lud's town*, and Ludgate from his being buried near it; but this is only one amongst many other derivations of the name of London, which are at least equally probable.

LUDAMAR, a country of Central Africa, situated in latitude 16. 30. north, and longitude 6. 30. west, and bounded on the south by Kaarta and Bambara, on the east by Timbuctoo, and on the north by the Great Desert. The inhabitants are Moors, who live in a state of great barbarity and bigoted Mahommedanism. They entirely neglect agriculture, and depend chiefly for subsistence on the rearing of cattle. Their only knowledge of manufactures consists in converting iron into spears and knives, and weaving cloth from goats' hair. Almost every inhabitant capable of bearing arms is liable to be called out in a military capacity, and must furnish his own horse and equipments. The king administers justice, but seldom inflicts capital punishments. He is distinguished from his subjects only by his dress being of a finer cloth, and by a tent of larger dimensions; but in ordinary intercourse his rank is little attended to; and he often eats out of the same dish, and sleeps in the same bed, with his menials. It was in this country that the traveller Major Houghton met his death, and Mr Park suffered such a rigorous captivity. The chief town is Benown, a miserable place, consisting of a number of dirty-looking huts scattered irregularly over an extensive space, and resembling a camp rather than a town.

LUDEHAUNAH, a town of Hindustan, situated on the north-west boundary of the province of Delhi, and on the south bank of the Sutlege river. It is one of the most remote military stations which the British possess in this quarter. The climate is cold for four months of the year, and in the summer season extremely hot, with hot winds. The rains are abundant. It is 180 miles north-north-west from the city of Delhi, and 120 south-east from Lahore. Long. 75. 32. E. Lat. 36. 53. N.

LUDENSCHEID, a city of the Prussian government of Arensburg, in Westphalia, in the circle of Altena. It stands between two lofty hills, and contains a Lutheran and a Calvinist church, 280 houses, and 1820 inhabitants. It is a place celebrated for its hardware, especially for saws, scythes, hoops, and many other articles.

LUDGERSHALL, a market and borough town of the county of Wilts, in the hundred of Amesbury, seventy miles from London and fifteen from Salisbury. It is pleasantly situated on the borders of the forest of Chute. It formerly returned two members to the House of Commons, but has been deprived of that privilege by the reform act. The population amounted in 1801 to 471, in 1811 to 487, in 1821 to 477, and in 1831 to 535.

LUDI, a term used for shows and public representations exhibited by the Romans for the entertainment of the people.

LUDIUS, a celebrated painter, who lived in the reign of Augustus Cæsar, and excelled in grand compositions. He was the first who painted the fronts of houses in the streets of Rome, which he beautified with a great variety of landscapes and many other subjects.

LUDLOW, Edmund, son of Sir Henry Ludlow, was born at Maidenhead, and educated in Trinity College, Oxford. His father being opposed to the king's interest, Mr Ludlow joined the same party, and was present at the battle of Edgehill as a volunteer under the Earl of Essex. Upon the death of his father, he was chosen knight of the shire for Wilts, and obtained the command of a regiment of horse for the defence of that county. He was one of the judges of Charles I. and after his death was sent by the parliament into Ireland, in quality of lieutenant-general of the horse, an employment which he discharged with diligence and success until the death of the lord-deputy Ireton, when he acted for some time as general, though without that title; Cromwell, who knew him to be sincerely in the interest of the commonwealth, always finding out some pretext to evade conferring that office upon him. The last stroke would have been given by Ludlow to the Irish rebellion, if the usurpation of Cromwell had not prevented it. Under his power he never acted; and though Cromwell used his utmost efforts to gain him, he remained inflexible. After Cromwell's death, he endeavoured to restore the commonwealth; but Charles II. being recalled, he thought proper to conceal himself, and escaped into Switzerland, where he settled. After the revolution, he came over to England, in order to be employed in Ireland against King James; but having appeared publicly in London, it gave great offence, and an address was presented by Sir Edward Seymour to King William III. praying for a proclamation in order to apprehend Colonel Ludlow, attainted for the murder of King Charles I. Upon this he returned to Switzerland, where he died. During his retirement in that country he wrote his Memoirs.

Ludlow, a borough and market town of the county of Salop, in the hundred of Munslow, 142 miles from London. It is situated at the confluence of the rivers Teme and Corfe, is well built, paved, and lighted, and has a spacious town-hall, a neat hospital, and school-house. The ancient castle, now in a state of dilapidation, was formerly used by the president of the court of the marches of Wales, and has been immortalized as the theatre of the first display of the poetic powers of Milton. The corporation consists of a high bailiff, two justices, twelve aldermen, and twenty-four common-council men. It is represented by two members in the House of Commons. The quarter-sessions for the county are held here, as well as a court of record for the borough. There are annual races, which are much attended. Ludlow is a cheap place, and has good markets on Monday, Wednesday, and Friday. The inhabitants amounted in 1801 to 3897, in 1811 to 4150, in 1821 to 4820, and in 1831 to 5253.

LUDOLPH, Job, a learned writer of the seventeenth century, was born at Erfurt, in Thuringia. He travelled much, was master of twenty-six languages, visited libraries, searched everywhere after natural curiosities and antiquities, and conversed with learned men of all nations. He published a History of Ethiopia, and other curious books.

Ludolph, *Henry William*, nephew of Job above mentioned, was born at Erfurt in 1655. He came to England as secretary to M. Lenthe, envoy from the court of Copenhagen to that of London; and being recommended to Prince George of Denmark, he was received by that prince as his secretary. He enjoyed this office for some years, until he was incapacitated by a violent disorder, when he was discharged with a handsome pension. After he had recovered, he travelled into Muscovy, where he was well received by the czar, and where his knowledge led the ignorant Muscovite priests to believe him a conjuror. On his return to London in 1694, he was cut for the stone; and, as soon as his health would permit, in acknowledgment of the civilities he received in Muscovy, he wrote a grammar of their language, that the natives might learn their own tongue in a regular method. He then travelled into the East, to inform himself of the state of the Christian church in the Levant; the deplorable condition of which induced him, after his return, with the aid of the Bishop of Worcester, to print an edition of the New Testament in the vulgar Greek, in order to present it to the Greek church. In 1709, when such numbers of Palatines came over to England, Mr Ludolph was appointed by Queen Anne one of the commissioners to manage the charities raised for them; and he died early in the following year. His collected works were published in 1712.

LUDWIGSBURG, a city of the kingdom of Wirtemburg, in the circle of the Neckar, and the capital of a bailiwick of the same name. It is situated in a rich and beautiful district, one of the royal residences, and the seat of the financial boards of the kingdom, is well built, and contains 1000 houses, with 5426 inhabitants, a considerable garrison, and a military academy. It has manufactures of cotton, woollen, and china-ware. The promenades around it are pleasant, and near to it is the palace Monrepos, the residence of the late dowager queen, formerly princess royal of England. Long. 9. 1. 32. E. Lat. 48. 53. 15. N.

LUDWIGSLUST, a town of the grand duchy of Mecklenburg-Schwerin, in the bailiwick of Grabow. It is the residence of the sovereign, who has a fine palace, with parks and pleasure-gardens around it. The palace is a large and highly-ornamented building, and contains a picture-gallery with some fine paintings. A new road, recently constructed, connecting Berlin with Hamburg, passes through this place, by which means it has become a great thoroughfare. The town contains a Lutheran and a Catholic church, 624 houses, and 3840 inhabitants, mostly depending for subsistence on the court.

LUFF, the order from the pilot to the steersman to put helm towards the lee-side of the ship, in order to make the ship sail nearer the direction of the wind. Hence, luff round, or luff a-lee, is the excess of this movement, by which it is intended to throw the ship's head up in the wind in order to tack her. A ship is also said to spring her luff when she yields to the effort of the helm, by sailing nearer to the line of the wind than she had done before.

Luff Tackle, a name given by sailors to any large tackle that is not destined for a particular place, but may be variously employed as occasion requires. It is generally somewhat larger than the jigger tackle, although smaller than those which serve to hoist the heavier materials into and out of the vessel, which latter are the main and fore tackles, the stay and quarter tackles, and so forth.

LUG-SAIL, a square sail, hoisted occasionally on the mast of a boat or small vessel, upon a yard which hangs nearly at right angles with the mast. These sails are more particularly used in the barca-longas navigated by the Spaniards in the Mediterranean.

LUGANO, a city, the capital of a circle of the same name, in the canton of Ticino, in Switzerland. It stands in a romantic situation on the lake of its own name, famous for the quantity and excellence of the fish caught in it, which in some degree supply Milan with that species of food. It is well built, and contains sixteen churches, seven religious houses, an ecclesiastical seminary, and 398 houses, with 4350 inhabitants, who are actively employed in the manufactures of silk, paper, and ironware, and grow abundance of moderately good wine. Long. 8. 57. 35. E. Lat. 45. 59.

56. N. It is the capital of the canton alternately with Belling and Locarno.

LUGDUNUM, in *Ancient Geography*, the capital of the Segusiani, in Gallia Celtica, situated on an eminence at the conflux of the Arar and Rhodanus, as the Celtic term *dun* indicates. It was built by Manutius Plancus, under Augustus, while commanding in that part of Gaul, and thither he led a colony. Lugdunum is now *Lyons*, capital of the Lyonnois.

Lugdunum Batavorum, in *Ancient Geography*, a town of the Batavi, in Gallia Belgica; now *Leyden*, in Holland.

LUGO, a city of Spain, in the province of Galicia, on the river Tuy, which runs to the Mino. In this place there are some manufactories of linen and stockings, and some tanneries. Near it is the mountain village of Cerbrero, whose fields are covered with snow four months in the year, but whose pasture in summer is excellent, and produces cheese, which is highly esteemed throughout Spain. At this place the army under Sir John Moore, in his celebrated retreat, having suffered the greatest hardships from the severity of the climate, the haste of their march, and the want of the requisite refreshments, offered battle to the enemy, which, however, was declined.

LUGOS, a town of the circle of Temesvar, in the province of Farther Theiss, in Hungary. It stands on the river Temes. It is the place of assembly of the provincial states, has a Minorite monastery and a Greek church, and contains 900 houses, with 4587 inhabitants, who grow some excellent wine. Long. 21. 52. 30. E. Lat. 45. 37. 50. N.

LUKE, St, the evangelist, and disciple of the apostles, was originally of Antioch, in Syria, and by profession a physician. He particularly attached himself to St Paul, and was his faithful companion in his travels and labours. He went with the apostle to Troas, in Macedonia, about the year 51; he wrote his gospel in Achaia about the year 53; and, ten years after, he compiled the Acts of the Apostles, which contains a history of thirty years. Of all the inspired writers of the New Testament, his works are written in the most elegant Greek. It is believed that St Luke died at Rome, or in Achaia.

Gospel of St Luke, a canonical book of the New Testament. Some think that it was properly St Paul's Gospel; and that, when the apostle speaks of *his* gospel, he means what is called St Luke's. Irenæus says that St Luke digested into writing what St Paul preached to the Gentiles; and Gregory Nazianzen tells us that St Luke wrote with the assistance of St Paul.

St Luke the Evangelist's Day, a festival in the Christian Church, observed on the 18th of October.

LUKIANOW, a circle of the province of Nishegorod, in Russia, extending from latitude 54. 31. to 54. 14. and from longitude 43. 43. to 45. 28. east. It is well supplied with the means of conveyance, by several rivers running into the Wolga, for its chief products, which consist of rye, hemp, and flax. It contains 185,000 inhabitants, of whom 50,000 are slaves. The capital, a city of the same name, is 840 miles from St Petersburg, at the junction of the rivers Tescha and Kochschtschwaki, and contains 267 houses, with 1560 inhabitants. Long. 44. 20. E. Lat. 55. 54. N.

LULLI, Jean Baptiste, one of the most celebrated musicians that has appeared in France since the revival of learning, was born at Florence. He was taken to France when very young, by a person of quality; and he carried the art of playing on the violin to the highest perfection. Louis XIV. appointed him superintendent of music. Some time afterwards, Perinna having introduced operas into France, and quarrelled with his company, he resigned his privilege to Lulli. Operas were then carried to the utmost perfection by this celebrated musician, and were attended with continual applause. From this time, Lulli every year produced a piece of his own composition, until his death, which happened in the year 1687.

LULLY, Raymond, a writer on alchemy, surnamed the Enlightened Doctor, was born in the island of Majorca in 1225. He applied himself with indefatigable labour to the study of the Arabian philosophy, chemistry, physic, and divinity, and acquired great reputation by his works. He at length went to preach the gospel in Africa, and was stoned to death in Mauritania, at the age of eighty. He is honoured as a martyr at Majorca, whither his body was carried. He wrote many treatises on the sciences, in which he shows much study and subtilty, but little judgment or solidity. A complete edition of his works was printed at Mentz. This person must not be confounded with Raymond Lully of Terraca, surnamed *Neophyta*, who, from being a Jew, turned Dominican friar, and maintained several opinions which were condemned by Gregory XI.

LUMGHANAT, an Afghan district in the province of Cabul, and situated principally on the banks of the Kameh River, but which formerly extended from the Indus to the Hindoo Koosh Mountains. The chief towns are, Jellalabad and Irjah. It was formerly a Hindu territory, and the natives had a peculiar dialect; but it is now possessed by different tribes of Afghans, particularly the Hazarehs.

LUMINOUS, an epithet applied to any thing that shines or emits light.

Luminous Emanations have been observed from human bodies, as also from those of brutes. The light arising from currying a horse, or from rubbing a cat's back, are well known. Instances of a similar kind have been observed on combing a woman's head. Bartholin gives us an account, which he entitles *Mulier Splendens*, of a lady in Italy whose body shone whenever slightly touched with a piece of linen. These effluvia of animal bodies have many properties in common with those produced from glass; such as being lucid, snapping, and not being excited without some degree of friction; and they are undoubtedly electrical, as a cat's back when stroaked has been found strongly electrical.

LUMEZZANO, two towns of Italy, in the delegation of Brescia, part of the Austrian government of Milan. One of them, with the addition of St Apollonia, is situated on a hill, and contains 1386 inhabitants; the other, called De Pieve, is situated in the valley of Trompia, and contains 1310 inhabitants. Both are celebrated for their manufactures of bayonets, gun-stocks, muskets, swords, pistols, daggers, and other weapons.

LUNA, in the jargon of the alchemists, signifies *silver*, which was so called from the supposed influence of the moon upon that metal.

Luna Cornea, in *Chemistry*, is a compound of muriatic acid with silver.

LUNAR, something relating to the moon.

Lunar Month. See Month.

Lunar Year consists of 354 days, or twelve synodical months. See Calendar and Year.

LUNAWARA, a town of Hindustan, in the province of Gujerat, and district of Gudara, where, in 1803, a treaty was concluded with the rajah by the British government, which freed him from the tribute he had before paid to Scindia. Long. 73. 46. E. Lat. 23. 5. N. It is sixty-five miles east-north-east from Ahmedabad.

LUND, a city of Sweden, in the province of Malmoe, near the river Hoje-An. It is without walls, and is the seat of a bishop, of a theological seminary, and of a university. There is a respectable cathedral, besides three other churches; and it contains about 400 houses, with 3640 inhabitants. The university has great reputation, and appropriate institutions to assist study. The library consists of 40,000 volumes, and there are good collections of natual history, of mechanical models, an observatory with good astronomical instruments, and a well-arranged botanical garden. The students at the full session are about [illegible]0. There are some manufactures, but the chief trade is that which arises from the university. Long. 13. 7. 22. E. Lat. 55. 42. 26. N.

LUNDY, an island in the mouth of the Bristol Channel, about eleven miles from the coast of Devonshire. It is about five miles in length and two in breadth, and is surrounded by rocks, except at one part, which is so narrow as to admit of not more than one person at a time reaching it. It has living on it but one family, who breed pigs, goats, and rabbits, and supply fowls and eggs to a part of the towns in Devonshire. Long. 4. 9. W. Lat. 51. 20. N.

LUNE, Lunula, in *Geometry*, a plane in the form of a crescent or half-moon, terminated by the circumference of two circles, which intersect each other within.

LUNEBURG, one of the provinces of the present kingdom of Hanover. It was formerly the duchy of that name, erected by the emperor of Germany, in the year 1235, and at length came to the Hanoverian branch of the family of Brunswick. It extends along the left bank of the river Elbe, by which it is divided from the Prussián and the Danish dominions. It is 4475 square miles in extent, and comprehends twelve cities, twenty-six market-towns, 184 parishes, in which are 1501 hamlets, 32,944 houses, and about 280,000 inhabitants. It is generally a level district, with a sandy soil; but near the rivers there is some good arable and pasture land, though the heaths form seven tenths of the whole province. The principal river is the Elbe, into which the Ilmenau, the Ohre, and their tributary streams, fall; but some of the rivers run to the Weser. The climate, though not unhealthy, is severely cold in winter, and as intensely hot in summer. The chief employment, besides husbandry, is spinning flax. The capital is the city of the same name, on the Ilmenau, which is navigable to the Elbe. It contains four churches, an orphan-house, two hospitals, and 1898 dwellings, mostly in a very ancient style, and 10,039 inhabitants. The place is now in a dilapidated state, and there are few public buildings, though there are institutions for education. There is but little trade, except in salt made from a saline spring, and in brewing, distilling, and tanning, for the use of the neighbourhood. Long. 10. 19. 32. E. Lat. 53. 15. 7. N.

LUNEL la Bille, a city of France, in the department of the Hérault and arrondissement of Montpellier. It is situated on a canal, connecting the river Bedairie with the lake of Magicio. It contains 650 houses, and 45,000 inhabitants, who produce Muscatel wine of a very celebrated flavour. Long. 4. 3. E. Lat. 43. 38. N.

LUNEVILLE, an arrondissement of the department of the Meurthe, in France. It extends over 672 square miles, is divided into seven cantons and 209 communes, and contains 71,500 inhabitants. The capital is the city of the same name, at the influx of the Bézouse into the Meurthe. The situation is very fine, and the country around it fertile. It is celebrated for the peace between Austria and France, which was concluded there in 1801. It contains 1300 houses, and 11,600 inhabitants. Long. 6. 5. 1. E. Lat. 48. 35. 33. N.

LUNENSE Marmor, in the natural history of the ancients, the name of that species of white marble now known amongst us by the name of *Carrara marble*, and distinguished from the statuary kind by its greater hardness and inferior splendour. It has ever been greatly esteemed in building and ornamental works, and is so still. It is of a close and fine texture, of a pure white, and much more transparent than any other of the white marbles. It has always been found in great quantities in Italy, and is so to this day.

LUNETTE, in *Fortification*, an enveloped counterguard, or elevation of earth, made beyond the second ditch, opposite to the places of arms, and differing from the ravelins only in situation. *Lunettes* are usually made in ditches full of water, and serve the same purpose as faussebrayes, namely, to dispute the passage of the ditch. *Lunettons* are small lunettes.

Lunette, in the manège, is a half horse-shoe, or such a shoe as wants the sponge, that is, the part of the branch which runs towards the quarters of the foot.

Lunette is also the name of two small pieces of felt, made round and hollow, to clap upon the eyes of a vicious horse, that is apt to bite, and strike with his fore feet, or that will not suffer his rider to mount.

LUNGS. See Anatomy.

LUNISOLAR Year, in *Chronology*, the space of 532 common years; found by multiplying the cycle of the sun by that of the moon.

LUPERCALIA, feasts instituted in ancient Rome, in honour of the god Pan. The word comes from *Lupercal*, the name of a place under the Palatine Mount, where the sacrifices were performed. The Lupercalia were celebrated on the 15th of the kalends of March, that is, on the 15th of February, or, as Ovid observes, on the 3d day after the ides. They are supposed to have been established by Evander. On the morning of this feast, the Luperci, or priests of Pan, ran naked through the streets of Rome, striking the married women they met on the hands and belly with a thong or strap of goats' leather, which was held an omen promising them fecundity and happy deliveries. This feast was abolished in the time of Augustus; but afterwards restored, and continued to the time of the Emperor Anastasius. Baronius says it was abolished by the pope in 496.

LUPERCI, a name given to the priests of the god Pan. The *luperci* were the most ancient order of priests in Rome; they were divided into two colleges or companies, the one called *Fabii* and the other *Quintilii*. To these Cæsar added a third, which he called *Julii*.

LURCHER, a kind of hunting-dog, much like a mongrel greyhound, with pricked ears, a shagged coat, and generally of a yellowish-white colour.

LURE, in falconry, a device of leather, in the shape of two wings, stuck with feathers, and baited with a piece of flesh, to call back a hawk when at a considerable distance

Lure, an arrondissement of the department of the Upper Saone, in France, extending over 881 square miles. It is divided into ten cantons, and these again into 211 communes, containing 118,500 inhabitants. The capital is the city of the same name, situated on the river Oignon, in a district woody and mountainous, in which are numerous mines of coal. It contains 430 houses, and 2420 inhabitants.

LURGAN, a town in the county of Armagh and province of Ulster, in Ireland, sixty-six miles from Dublin. It is a flourishing town, agreeably situated in the midst of a much improved country; and the inhabitants are extensively engaged in the linen manufacture. It stands on a gentle eminence, about two miles from Lough Neagh, of which it commands a most beautiful and extensive prospect. Long. 6. 31. W. Lat. 54. 35. N.

Lurgan Green, a town of Ireland, in the county of Louth and province of Leinster, thirty-seven miles from Dublin; a little beyond which is a handsome seat of the Earl of Charlemont.

LUS, a city of France, the capital of a canton in the department of the Upper Pyrenees. It stands in a romantic situation in the pleasing valley of Bastan, at the foot of the Pic de Leyrey, and on the Gave de Barrèges, and contains about 2200 inhabitants. Near to it is the mineral spring of St Sauveur, which is frequented by invalids, both for drinking and bathing, the water being of the temperature 98° of Fahrenheit.

Lus, a district in the eastern part of the Persian province of Mekran, the country of the ancient Oritæ. It is of a circular form, and bounded on three sides by an immense range of mountains, separating it from the western part of Mekran, Beloochistan, and Scind. The face of the country is flat and sandy, producing abundant crops of every species of grain. There are four passes through the mountains which encompass Lus; two into Scind, one into western Mekran, and one into Beloochistan. The country is under the jurisdiction of a petty chief, who can bring about 4000 irregular troops into the field, and enjoys a revenue of 50,000 rupees per annum. The capital is Bayla; but the chief maritime port is Sommeany, which is a small and mean place.

LUSATIA. See Lausatia.

LUSITANIA, in *Ancient Geography*, one of the divisions of Spain, extending to the north of the Tagus, quite to the sea of Cantabria, at least to the Promontorium Celticum. But Augustus, by a new regulation, made the Anas its boundary to the south, and the Durius to the north; thus constituting only a part of the modern Portugal.

LUSTRAL, an epithet given by the ancients to the water used in their ceremonies for sprinkling and purifying the people. From them the Catholics have borrowed the holy water used in their churches.

Lustral Day (*Dies Lustricus*), that on which the lustrations were performed for a child, and its name given, which was usually the ninth day after the birth of a boy, and the eighth after that of a girl; though some performed the ceremony on the last day of the week in which the child was born, and others on the fifth day after its birth.

Over this feast-day the goddess Nundina was supposed to preside. The midwives, nurses, and domestics handed the child backwards and forwards, around a fire burning on the altars of the gods, after which they sprinkled it with water; and hence this feast received the name of *amphidromia*. The old women mixed saliva and dust with the water; and the whole ended with a sumptuous entertainment. The parents received gifts from their friends on this occasion. If the child was a male, their door was decked with an olive garland; if a female, with wool, denoting the work about which women were employed.

LUSTRATION, in *Antiquity*, sacrifices or ceremonies by which the ancients purified their cities, fields, armies, or people, defiled by any crime or impurity. Some of these lustrations were public and others private. There were several ways of performing lustration, viz. by fire, by sulphur, by water, and by air, the last being done by fanning and agitating the air round the thing to be purified. Some of these lustrations were necessary, and could not be dispensed with, as lustrations of houses in time of a plague, or upon the death of any person; others, again, were performed from choice, and at pleasure. The public lustrations at Rome were celebrated every fifth year, in which they led a victim thrice round the place to be purified, and in the mean time burned a great quantity of perfumes. The country lustrations, called *ambarvalia*, were celebrated before the peasants began to reap the corn; in those of the armies, called *armilustria*, some chosen soldiers, crowned with laurel, led the victims, a cow, a sheep, and a bull, thrice round the army ranged in battle-array in the field of Mars, to which deity the victims were subsequently sacrificed, after pouring out many imprecations upon the enemies of the Romans. The lustrations of the flocks were performed in this manner. The shepherd sprinkled them with pure water, thrice surrounded his sheepfold with a composition of savin, laurel, and brimstone set on fire, and afterwards sacrificed to the goddess Pales an offering of milk boiled, wine, a cake, and millet. As for private houses, they were lustrated with water, a fumigation of laurel, juniper, olive-tree, savin, and the like; and the victim was commonly a pig. Lustrations made for particular persons were commonly called *expiations*, and the victims *piacula*. There was also for infants a kind of lustration, by which they were purified, girls on the third, and boys on the ninth day after their birth; a ceremony which was performed with pure water and spittle. In lustratory sacrifices, the Athenians sacrificed two men, one for the men of their city, and the other for the women. Several of these expiations were austere; some fasted, others abstained from all sensual pleasures; and a few, as the priests of Cybele, castrated themselves. The postures of the penitents were different according to the different sacrifices. The priests changed their habits according to the ceremony to be performed; but white, purple, and black, were the most usual colours. They cast into the river, or at least out of the city, the animals or other things which had served for a lustration or sacrifice of atonement; and thought themselves threatened with some great misfortune when by chance they trod upon them. Part of these ceremonies were abolished by the Emperor Constantine and his successors; the rest subsisted till the Gothic kings became masters of Rome, when they expired.

LUSTRUM, in Roman antiquity, a general muster and review of all the citizens and their goods, which was performed every fifth year by the censors, who afterwards made a solemn lustration. This custom was first instituted by Servius Tullius, about 180 years after the foundation of Rome. In the course of time the lustra were not celebrated so often; for we find the fifth lustrum celebrated at Rome only in the 574th year of that city.

LUTE, or Loting, amongst chemists, a mixed, tenacious, ductile substance, which grows solid by drying, and, being applied to the juncture of vessels, stops them up so as to prevent the air from getting in or out.

Lute is also a stringed musical instrument. The lute consists of four parts; the table; the body or belly, which has nine or ten sides; the neck, which has nine or ten stops or divisions, marked with strings; and the head or cross, where the screws for raising and lowering the strings to a proper pitch of tone are fixed. In the middle of the table there is a rose or passage for the sound; there is also a bridge to which the strings are fastened, and a piece of ivory between the head and the neck to which the other extremities of the strings are fitted. In playing, the strings are struck with the right hand, and with the left the stops are pressed. The lutes of Bologna are esteemed the best, on account of the wood, which is said to be peculiarly fitted for producing a sweet sound.

LUTETIA Parisiorum, in *Ancient Geography*, a town of the Parisii, in Gallia Celtica, situated on an island in the Sequana or Seine. It received its name, as some suppose, from the quantity of clay, *lutum*, which is found in its neighbourhood. Julius Cæsar fortified and embellished it, from which circumstance some authors call it *Julii Civitas*. Julian the Apostate resided there for some time. It is now *Paris*, the capital of France, being so called from its name *Paryis* in the lower age.

LUTHER, Martin, the famous author of the Reformation, was a native of Eisleben, in Saxony, and born in 1483. Though his parents were poor, he received a learned education, during the progress of which, he gave many indications of uncommon vigour and acuteness of genius. As his mind was naturally susceptible of serious impressions, and somewhat tinctured with that religious melancholy which delights in the solitude and devotion of a monastic life, he retired into a convent of Augustinian friars, where he acquired great reputation, not only for piety, but also for love of knowledge and unwearied application to study. The cause of this retirement is said to have been, that he was once struck by lightning, whilst his companion was killed by his side by the same flash. He had been taught the scholastic philosophy which was in vogue in those days, and had made considerable progress in it; but hap-pening to find a copy of the Bible which lay neglected in the library of his monastery, he applied himself to the study of it with an eagerness and assiduity which quite astonished the monks, and so much increased his reputation for sanctity, that he was chosen professor, first of philoso-phy, and afterwards of theology, at Wittemberg, on the Elbe, where Frederick elector of Saxony had founded an university.

Whilst Luther continued to enjoy the highest reputation for sanctity and learning, Tetzel, a Dominican friar, came o Wittemberg in order to publish indulgences. Luther beheld his success with great concern; and having first nveighed against indulgences from the pulpit, he after-wards published ninety-five theses, containing his senti-ments on that subject. These he proposed, not as points fully established, but as subjects of inquiry and disputation. He appointed a day on which the learned were invited to mpugn them either in person or by writing; and to the whole he subjoined solemn protestations of his high respect for the apostolic see, and of his implicit submission to its authority. No opponent appeared at the time fixed; but he theses spread over Germany with astonishing rapidity, nd were read with the greatest eagerness.

Though Luther met with no opposition for some little me after he began to publish his new doctrines, it was not ong before many zealous champions arose to defend those pinions with which the wealth and power of the clergy were so strictly connected. Their cause, however, was by no means promoted by these endeavours; for the people began o call in question even the authority of the canon law, and f the pope himself. The court of Rome at first despised hese new doctrines and disputes; but at length the atten-on of the pope being excited by the great success of the eformer, and the complaints of his adversaries, Luther was, n the month of July 1518, summoned to appear at Rome, within sixty days, before the auditor of the chamber; and ne of his adversaries, named Prierias, who had written gainst him, was appointed to examine his doctrines, and o decide concerning them. At the same time the pope wrote to the elector of Saxony, beseeching him not to pro-ect a man whose heretical and profane tenets were so hocking to pious ears; and enjoined the provincial of the Augustinians to check by his authority the rashness of an rrogant monk, which brought disgrace upon their order, nd gave offence and disturbance to the whole church.

From these letters, and the appointment of his open nemy Prierias as his judge, Luther easily foresaw what ntence he might expect at Rome; and therefore dis-overed the utmost solicitude to have his cause tried in ermany, and before a less suspected tribunal. He wrote submissive letter to the pope, in which he promised an nreserved obedience to his will, for as yet he entertained o doubt of the divine origin of the papal authority; and y the intercession of the other professors, Cajetan, the ope's legate in Germany, was appointed to hear and de-rmine the cause. Luther appeared before him without esitation; but Cajetan thought it below his dignity to dis-ute the point with a person so much his inferior in rank, nd therefore required him, by virtue of the apostolic powers ith which he was invested, to retract the errors which he ad uttered with regard to indulgences and the nature of ith, and to abstain for the future from the publication of ew and dangerous opinions, at the same time forbidding m to appear in his presence, unless he proposed to com-y with what had been required of him.

This haughty and summary manner of proceeding, together with some other circumstances, gave Luther's friends strong reason to suspect that even the imperial safe-conduct would not be sufficient to protect him from the legate's power and resentment; and they prevailed on him secretly to withdraw from Augsburg, where he had attended the legate, and to return to his own country. But before his departure, he prepared, according to a form of which there had been some examples, a solemn appeal from the pope ill informed concerning his cause, to the pope when he should receive more full information with respect to it. Cajetan, enraged at Luther's abrupt retreat, and at the publication of his appeal, wrote to the elector of Saxony, complaining of both, and requiring him, as he regarded the peace of the church, or the authority of its head, either to send the seditious monk as a prisoner to Rome, or to banish him out of his territories. The elector had hitherto, from political motives, protected Luther, thinking he might be useful in checking the enormous power of the see of Rome; and though all Germany resounded with his fame, the elector had never yet admitted him into his presence. But upon this demand being made by the cardinal, it became necessary to throw off somewhat of his former reserve. He had been at great expense, and bestowed much attention, on founding a new university, an object of considerable importance to every German prince; and foreseeing how fatal a blow the removal of Luther would be to its reputation, he not only declined complying with either of the pope's requests, but openly discovered great concern for Luther's personal safety.

In the mean time, the situation of the reformer became daily more and more embarrassing. He knew very well what were the motives which induced the elector to afford him protection, and that he could by no means depend upon a continuance of his friendship. If he should be obliged to quit Saxony, he had no other asylum, and would stand exposed to whatever punishment the rage or bigotry of his enemies could inflict; and so ready were his adversaries to condemn him, that he had been declared a heretic at Rome before the expiration of the sixty days allowed him in the citation for making his appearance. Notwithstanding all this, however, he discovered no symptoms of timidity or remissness, but continued to vindicate his own conduct and opinions, and to inveigh against those of his adversaries with greater vehemence than ever. Being convinced, therefore, that the pope would soon proceed to the most violent measures against him, he appealed to a general council, which he affirmed to be the representative of the Catholic church, and superior in power to the pope, who, being a fallible man, might err, as St Peter, the most perfect of his predecessors, had done.

The court of Rome were in the mean time equally assiduous to crush the author of these new doctrines, which gave them so much uneasiness. A bull was issued by the pope, of a date prior to Luther's appeal, in which he magnified the virtues of indulgences, and subjected to the heaviest ecclesiastical censures all who presumed to teach a contrary doctrine. Such a clear decision of the sovereign pontiff against him might have been fatal to the cause of Luther, had not the death of the Emperor Maximilian, which happened on the 17th of January 1519, contributed to give matters a different turn. Both the principles and interest of Maximilian had prompted him to support the authority of the see of Rome; but, in consequence of his death, the vicariate of that part of Germany which is governed by the Saxon laws devolved to the elector of Saxony; and, under the shelter of his friendly administration, Luther himself enjoyed tranquillity, and his opinions took such root in different places, that they could never afterwards be eradicated. At the same time, as the election of an emperor was a point more interesting to the pope, Leo X., than a theological controversy which he did not understand, and of which he could not foresee the consequences, he was so extremely solicitous not to irritate a prince of such considerable influence in the electoral college as Frederick, that he discovered a great unwillingness to pronounce the sentence of excommunication against Luther, which his adversaries continually demanded with the most clamorous importunity.

From the reason just now assigned, and Leo's natural aversion to severe measures, a suspension of proceedings against Luther ensued for eighteen months, though perpetual negociations were carried on during this interval in order to bring the matter to an amicable issue. The manner in which these were conducted having given our reformer many opportunities of observing the corruption of the court of Rome, its obstinacy in adhering to established errors, and its indifference about truth, however clearly proposed or strongly proved, he began, in 1520, to utter some doubts with regard to the divine origin of the papal authority, which he publicly disputed with Eccius, one of his most learned and formidable antagonists. The dispute was indecisive, both parties claiming the victory; but it must have been very mortifying to the partizans of the Catholic church to hear such an essential point of their doctrine publicly attacked.

The papal authority being once suspected, Luther proceeded to push on his inquiries from one doctrine to another, until at last he began to attack the firmest foundations on which the wealth and power of the church were established. Leo then began to perceive that there were no hopes of reclaiming such an incorrigible heretic, and therefore prepared to denounce against him the sentence of excommunication. The college of cardinals was often assembled, in order to prepare the sentence with due deliberation; and the ablest canonists were consulted how it might be expressed with unexceptionable formality. At last it was issued on the 15th of June 1520. Forty-one propositions, extracted out of Luther's works, were therein condemned as heretical, scandalous, and offensive to pious ears; all persons were forbidden to read his writings, upon pain of excommunication; such as had any of them in their custody were commanded to commit them to the flames; he himself, if he did not, within sixty days, publicly recant his errors, and burn his books, was pronounced an obstinate heretic, excommunicated, and delivered to Satan for the destruction of the flesh; and all secular princes were required, under pain of incurring the same censure, to seize his person, that he might be punished as his crimes deserved.

Luther was not in the least disconcerted by this sentence, which he had for some time expected. He renewed his appeal to a general council; he declared the pope to be the antichrist, or man of sin, whose appearance is foretold in the New Testament; he declaimed against his tyranny with greater vehemence than ever; and at last, by way of retaliation, having assembled all the professors and students in the university of Wittemberg, with great pomp, and in the presence of a vast multitude of spectators, he cast the volumes of the canon law, together with the bull of excommunication, into the flames. The manner in which this action was justified gave still greater offence than the action itself. Having collected from the canon laws some of the most extravagant propositions with regard to the plenitude and omnipotence of the pope's power, as well as the subordination of all secular jurisdiction to his authority, he published these with a commentary, pointing out the impiety of such tenets, and their evident tendency to subvert all civil government.

On the accession of Charles V. to the empire, Luther found himself in a very critical situation. Charles, in order to secure the pope's friendship, had determined to treat him with great severity. His eagerness to gain this point rendered him not averse to gratify the papal legates in Germany, who insisted, that, without any delay or formal deliberation, the diet then sitting at Worms ought to condemn a man whom the pope had already excommunicated as an incorrigible heretic. Such an abrupt manner of proceeding, however, being deemed unprecedented and unjust by the members of the diet, they made a point of Luther's appearing in person, and declaring whether or not he adhered to those opinions which had drawn upon him the censures of the church. Not only the emperor, but all the princes through whose territories he had to pass, granted him a safe-conduct; and Charles wrote to him at the same time, requiring his immediate attendance on the diet, and renewing his promises of protection from any injury or violence. Luther did not hesitate one moment about yielding obedience, and set out for Worms, attended by the herald who had brought the emperor's letter and safe-conduct. Whilst on his journey, many of his friends, whom the fate of Huss, under similar circumstances, and notwithstanding the same security of an imperial safe-conduct, filled with solicitude, earnestly advised and entreated him not to rush wantonly into the midst of danger. But Luther, superior to such terrors, silenced them with this reply; "I am lawfully called to appear in that city; and thither will I go in the name of the Lord, though as many devils as there are tiles on the houses were there combined against me."

The reception which he met with at Worms was such as might have been reckoned a full reward of all his labours, if mere vanity and the love of applause had been the principles by which he was influenced. Greater crowds assembled to behold him than had appeared at the emperor's public entry; his apartments were daily filled with princes and personages of the highest rank; and he was treated with an homage more sincere, as well as more flattering, than any which pre-eminence in birth or condition can command. At his appearance before the diet, he behaved with decency and firmness. He readily acknowledged an excess of acrimony and vehemence in his controversial writings; but refused to retract his opinions unless he were convinced of their falsehood, or to consent to their being tried by any other rule than the word of God. When neither threats nor entreaties could prevail on him to depart from this resolution, some of the ecclesiastics proposed to imitate the example of the council of Constance, and, by punishing the author of this pestilent heresy, who was now in their power, to deliver the church at once from such an evil. But the members of the diet refused to expose German integrity to fresh reproach by a second violation of public faith, and Charles being no less unwilling to bring a stain upon the beginning of his administration by such an ignominious action, Luther was permitted to depart in safety. A few days after he had left the city, a severe edict was published in the emperor's name, and by authority of the diet, depriving him, as an obstinate and excommunicated criminal, of all the privileges which he enjoyed as a subject of the empire; forbidding any prince to harbour or protect him; and requiring all to seize his person as soon as the term specified in his protection should have expired.

But this vigorous decree had no considerable effect; the execution of it being prevented partly by the multiplicity of occupations which the commotions in Spain, together with the wars in Italy and the Low Countries, created to the emperor, and partly by a prudent precaution employed by the elector of Saxony, Luther's steady patron. As Luther, on his return from Worms, was passing near Altenstrain, in Thuringia, a number of horsemen in masks rushed suddenly out of a wood, where the elector had appointed them to lie in wait for him, and, surrounding his company, carried him, after dismissing all his attendants, to Wortburg, a strong castle not far distant. There the elector

Luther.

ordered him to be supplied with every thing necessary or agreeable; but the place of his retreat was carefully concealed, until the fury of the storm which had been raised against him began to abate, upon a change in the political system of Europe. In this solitude, where he remained nine months, and which he frequently called his *Patmos*, he exerted his usual vigour and industry in defence of his doctrines, or in confutation of his adversaries, publishing several treatises, which revived the spirit of his followers, who had been astonished and disheartened at the sudden disappearance of their leader.

Luther, weary at length of his retirement, re-appeared publicly at Wittemberg, upon the 6th of March 1522. This he did without the elector's leave, but he immediately wrote Frederick a letter to prevent his taking it amiss. The edict of Charles V., severe as it was, had given little or no check to Luther's doctrine; for the emperor had no sooner returned to Flanders than his edict was neglected, and the new doctrine seemed to spread even faster than before. In Luther's absence, Carolostadius had pushed on things faster than his leader; he had attempted to abolish the use of mass, to remove images out of the churches, to set aside auricular confession, invocation of saints, and the abstaining from meats; he had allowed the monks to leave their monasteries, to violate their vows, and to marry; in a word, he had quite changed the doctrine and discipline of the church at Wittemberg; all which, though not against Luther's sentiments, was yet blamed by him, as being rashly and unseasonably done. Lutheranism was still confined to Germany. It had not yet extended to France; and Henry VIII. of England passed the most rigorous acts to prevent it from invading his realm. Nay, he did something more. To show his zeal for religion and the holy see, and perhaps also to exhibit his skill in theological learning, he wrote a treatise on the Seven Sacraments, against Luther's book on the Captivity of Babylon, which he presented to Leo X. in October 1521. The pope received it very favourably, and was so well pleased with the king of England, that he complimented him with the title of Defender of the Faith. Luther, however, paid no regard to his rank as a sovereign, but answered him with great sharpness, treating both his person and performance in the most contemptuous manner. Henry complained of Luther's rude usage of him to the princes of Saxony; and Fisher, bishop of Rochester, replied to his answer, in support of Henry's treatise; but neither the king's complaint, nor the bishop's reply, was attended with any visible effects.

Luther, though he had put a stop to the more direct and honest proceedings of Carolostadius, now made open war with the pope and bishops; and, that he might induce the people to despise their authority, he wrote one book against the pope's bull, and another against the order called the Order of Bishops. The same year, 1522, he wrote a letter, dated the 29th of July, to the assembly of the states of Bohemia, in which he assured them that he was labouring to establish their doctrine in Germany, and exhorted them not to return to the communion of the church of Rome; and the same year he also published a translation of the New Testament in the German tongue, which was afterwards corrected by himself and Melancthon. This translation having been several times printed, and having passed into every body's hands, Ferdinand, archduke of Austria, the emperor's brother, issued a severe edict, to prevent the further publication of it; forbidding all the subjects of his imperial majesty to have any copies of it, or of Luther's other books, in their possession. Some other princes followed his example, and Luther was so incensed that he wrote a treatise on the secular power, in which he accused them of tyranny and impiety. The diet of the empire was held at Nuremberg, about the end of the year, and to it Adrian VI. sent his brief, dated the 25th of November; for Leo X. had died upon the 2d of December 1521, and Adrian had been elected pope upon the 9th of January following. In this brief he observes, amongst other things, to the diet, how he had heard with grief, that Martin Luther, after the sentence of Leo X. which had been ordered to be executed by the edict of Worms, continued to teach the same errors, and daily to publish books full of heresies; that it appeared strange to him, that so large and so religious a nation could be seduced by a wretched apostate friar; that nothing, however, could be more pernicious to Christendom; and therefore he exhorted them to use their utmost endeavours to make Luther, and the authors of these tumults, return to their duty, or, if they refused and continued obstinate, to proceed against them according to the laws of the empire, and the tenor of the last edict.

The resolution of this diet was published in the form of an edict, upon the 6th of March 1523; but it had no effect in checking the Lutherans, who still went on with undiminished boldness and confidence. This year Luther wrote a great many pieces, amongst which was one upon the dignity and office of the supreme magistrate, which Frederick, elector of Saxony, is said to have been highly pleased with. About the same time he sent a writing in the German language to the Waldenses in Bohemia and Moravia, who had applied to him about worshipping the body of Christ in the Eucharist. He also wrote another book, which he dedicated to the senate and people of Prague, concerning the institution of ministers of the church; and he drew up a form of saying mass. He wrote a piece entitled An Example of Popish Doctrine and Divinity, which Dupin calls "a satire against nuns, and those who profess a monastic life." He also wrote against the vows of virginity, in his preface to his commentary on 1 Corinthians, chap. viii.; and his exhortations were, it seems, followed with effects, for soon afterwards, nine nuns, amongst whom was Catharine de Bore, eloped from the nunnery at Nimptschen, and were brought, by the assistance of Leonard Coppen, a burgess of Torgau, to Wittemberg. Whatever offence this proceeding might give to the Catholics, it was highly extolled by Luther, who, in a book written in the German language, compares the deliverance of these nuns from the slavery of a monastic life, to that of the souls which Jesus Christ had delivered by his death. This year Luther had occasion to canonize two of his followers, who, as Melchior Adam relates, were burned at Brussels in the beginning of July, and were the first who suffered martyrdom for his doctrine. He likewise wrote a consolatory epistle to three noble ladies at Misnia, who had been banished from the Duke of Saxony's court at Friburg for reading his books.

In the beginning of the year 1524, Clement VII. sent a legate to the German diet, which was to be held at Nuremberg. Adrian VI. had died in October 1523, and, on the 19th of November, been succeeded by Clement. A little before his death, he canonized Benno, who had been bishop of Meissen in the time of Gregory VII. and one of the most zealous defenders of the holy see. Luther, imagining that this was done directly to oppose him, drew up a piece entitled Against the New Idol and Old Devil set up at Meissen; a production in which he treats the memory of Gregory with great freedom, and does not spare even that of Adrian. The legate of Clement VII. represented to the diet of Nuremberg the necessity of enforcing the execution of the edict of Worms, which had been strangely neglected by the princes of the empire; but, notwithstanding the legate's solicitations, which were very pressing, the decrees of the diet were thought so ineffectual, that they were condemned at Rome, and rejected by the emperor. In this year began the dispute between Luther and Erasmus, about free-will. Erasmus had been much courted by the Catholics to write against Luther; but he was all along of opinion that writing would not be found an effectual way to terminate the differences, and re-establish the peace of the church. However, overcome by the importunities of the pope and the Catholic princes, and desirous at the same time to clear himself from the suspicion of favouring a cause which he would not seem to countenance, he resolved to write against Luther, though, as he tells Melancthon, it was with some reluctance, and chose the subject of free-will as his theme. His book was entitled a Diatribe or Conference about Free-will, and was written with much moderation, and without personal reflections. In the preface, he tells Luther "that he ought not to take his dissenting from him in opinion ill, because he had allowed himself the liberty of differing from the judgment of popes, councils, universities, and doctors of the church." Luther was some time before he answered Erasmus's book, but at last he published a treatise *De Servo Arbitrio*, or of the Servitude of Man's Will; and though Melancthon had promised Erasmus that Luther should answer him with civility and moderation, yet Luther had so little regard to Melancthon's promise, that he never wrote any thing more severe. He accused Erasmus of being careless about religion, and little solicitous what became of it, provided the world continued in peace; and that his notions were rather philosophical than Christian. Erasmus immediately replied to Luther in a piece called *Hyperaspistes*, in the first part of which he answers his arguments, and in the second his personal reflections.

In October 1524, Luther threw off the monastic habit, which, though not premeditated or designed, was yet a very proper preparative to a step which he took the year following; we mean his marriage with Catharine de Bore. Catharine de Bore was a gentleman's daughter, who had been a nun, and was taken, as we have observed, out of the nunnery of Nimptschen, in the year 1523. Luther had a design, as Melchior Adam relates, to marry her to Glacius, a minister of Ortamunden; but she did not like Glacius, and so, on the 13th of June 1525, Luther married her himself. This conduct of his was severely blamed, not only by the Catholics, but, as Melancthon says, by those of his own party. He was even for some time ashamed of it himself, and owns that his marriage had made him so despicable, that he hoped his humiliation would rejoice the angels, and vex the devils. Melancthon found him so afflicted with what he had done, that he wrote some letters of consolation to him. It was not so much the marriage, as the circumstances of the time, and the precipitation with which it was constituted, that occasioned the censures which were passed upon Luther. He married all of a sudden, and at a time when Germany was groaning under the miseries of a war which was said to be owing to Lutheranism. Besides, it was thought to be an indecent thing in a man of forty-two years of age, who was then, as he professed, restoring the Gospel, and reforming mankind, to involve himself in marriage with a woman of twenty-six, either through incontinence, or upon any other account whatsoever. But Luther, as soon as he had recovered himself a little from this abasement, assumed his former air of intrepidity, and boldly supported what he had done. "I took a wife," says he, "in obedience to my father's commands; and hastened the consummation, in order to prevent impediments, and stop the tongues of slanderers." It appears, from his own confession, that he was much attached to Catharine de Bore, and used to call her by endearing names, which made profane people think and say wicked things of him. "And therefore," says he, "I married of a sudden, not only that I might not be obliged to hear the clamours which I knew would be raised against me, but to stop the mouths of those who reproached me with Catharine de Bore." Luther also gives us to understand that he did it partly as concurring with his grand scheme of opposing the Catholics.

Luther, notwithstanding, was not himself altogether satisfied with these reasons. He did not think the step which he had taken could be sufficiently justified upon the principles of human prudence; and therefore we find him, in other places, endeavouring to account for it from a supernatural impulse. But whether there was any thing divine in it or not, Luther found himself extremely happy in his new state, especially after his wife had brought him a son. "My rib Kate," says he in the joy of his heart, "desires her compliments to you, and thanks you for the favour of your kind letter. She is very well, through God's mercy. She is obedient and complying with me in all things, and more agreeable, I thank God, than I could have expected; so that I would not change my poverty for the wealth of Crœsus." According to Seckendorf, he had been heard to say, that he would not exchange his wife for the kingdom of France, nor for the riches of the Venetians, and that for three reasons; first, because she had been given him by God, at the time when he implored the assistance of the Holy Ghost, in finding a good wife; secondly, because, though she was not without faults, yet she had fewer than other women; and, thirdly, because she religiously observed the conjugal fidelity she owed him. At first a report was circulated that Catharine de Bore had been confined soon after her marriage with Luther; but Erasmus, who had communicated that piece of news to his friends, acknowledged a little afterwards that there was no foundation for the scandal. His marriage, however, did not retard his activity and diligence in the work of reformation. He revised the Augsburg Confession of Faith, and Apology for the Protestants, when the Protestant religion was first established on a firm basis.

After this, Luther had little else to do than to sit down and contemplate the mighty work which he had completed. That a single monk should have been able to give the church so rude a shock, that there needed but such another entirely to overthrow it, may very well seem a mighty work. Indeed he did little else; for the remainder of his life was spent in exhorting princes, states, and universities, to confirm the reformation which had been brought about through him; and in publishing from time to time such writings as might serve to encourage, direct, and aid them in doing so. The emperor threatened temporal punishment with armies, and the pope eternal damnation with bulls and anathemas; but Luther cared for none of their menaces. His friend and coadjutor Melancthon was not so indifferent; for he had in his composition a great deal of softness, moderation, and diffidence, which made him uneasy, and even sorrowful, on account of the present disorders. Hence we find many of Luther's letters written on purpose to support and comfort him under these natural distresses and anxieties.

In the year 1533, Luther wrote to the citizens of Oschatz, who had suffered some hardships for adhering to the Augsburg Confession of Faith, a consolatory epistle, in which, amongst other things, he says, "The devil is the host, and the world is his inn; so that wherever you come, you shall be sure to find this ugly landlord." He had also about this time a terrible controversy with George duke of Saxony, who had such an aversion to Luther's doctrine that he obliged his subjects to take an oath that they would never embrace it. However, sixty or seventy citizens of Leipzig were found to have deviated a little from the Catholic way in some point or other, and they were known previously to have consulted Luther about it; upon which George complained to the Elector John, that Luther had not only abused his person, but also preached up rebellion amongst his subjects. The elector ordered Luther to be made acquainted with this; and to be told at the same time, that if he did not clear himself of the charge, he could not possibly escape punishment. But Luther easily refuted the accusation, by proving that he had been so far from stirring up his subjects against him upon the score of religion, that, on the contrary, he had exhorted them to undergo the greatest hardships, and even suffer themselves to be banished, rather than offer any resistance.

The Bible translated by him into German was first printed in the year 1534, as the old privilege, dated at Bibliopolis, under the elector's hand, shows; and it was published the year after. He also published, the same year, a book against masses and the consecration of priests, in which he relates a conference he had with the devil upon those points; for it is remarkable in Luther's whole history, that he never had any conflicts of any kind within, but the devil was always his antagonist. In February 1537, an assembly was held at Smalcalde, about matters of religion, to which Luther and Melancthon were summoned. At this meeting Luther was seized with so grievous an illness that there seemed to be no hopes of his recovery. He was afflicted with the stone, and had a stoppage of urine for eleven days. In this terrible condition he must needs undertake to travel, notwithstanding all that his friends could say or do to prevent him. His resolution, however, was attended with a good effect; for the night after his departure he began to grow better. As he was carried along, he made his will, in which he bequeathed his detestation of popery to his friends and brethren, agreeably to what he often used to say, *Pestis eram vivus, moriens ero mors tua, papa;* "I was the plague of popery in my life, and shall continue to be so in my death."

This year the pope and the court of Rome, finding it impossible to deal with the Protestants by force, began to have recourse to stratagem. They therefore affected to think, that though Luther had indeed carried on things with a high hand, and to a violent extreme, yet that what he had pleaded in defence of these measures was not entirely without foundation. They talked with a seeming show of moderation; and Pius III. who had succeeded Clement VII. proposed a reformation first amongst themselves, and even went so far as to fix a place for a council to assemble for that purpose. But Luther treated this farce as it deserved; he unmasked and detected it immediately; and, to ridicule it the more strongly, he caused a picture to be drawn, in which were represented the pope seated on high upon a throne, some cardinals about him with foxes' tails on, and seeming *sursum deorsum repurgare*, as Melchior Adam expresses it. This gross design was fixed over against the title-page, to let the reader see at once the scope and object of the book, which was, to expose that cunning and artifice with which those subtile politicians affected to cleanse and purify themselves from their errors and superstitions. About the same time, Luther published a Confutation of the Pretended Grant of Constantine to Sylvester bishop of Rome, and also some letters of John Huss, written from his prison at Constance to the Bohemians.

In this manner was Luther employed until his death, which happened in the year 1546. His works were collected after his decease, and printed at Wittemberg in seven volumes folio.

LUTHERANISM, the opinions and doctrines of Martin Luther in regard to religion.

Lutheranism has undergone some alterations since the time of its founder. Luther rejected the epistle of St James, as inconsistent with the doctrine of St Paul relating to justification; and he also set aside the Apocalypse, both of which are now received as canonical in the Lutheran church. He reduced the number of sacraments to two, viz. Baptism and the Eucharist; but he believed in impanation, or the consubstantiation of the matter of the bread and wine with the body and blood of Christ; and it is in this article that the main difference consists between the Lutherans and English church.

Luther maintained that the mass was no sacrifice, and exploded the adoration of the host, auricular confession, meritorious works, indulgences, purgatory, the worship of images, and other observances which he considered as the growth of corrupt times. He also opposed the doctrine of free-will, maintained predestination, and asserted our justification to be solely by the imputation of the merits and satisfaction of Christ. He likewise opposed the fastings in the Roman Catholic church, monastical vows, the celibacy of the clergy, and many things besides.

LUTHERANS, the Christians who follow the opinions of Martin Luther, one of the principal reformers of the church in the sixteenth century.

The Lutherans, of all Protestants, are those who differ the least from the Catholic church; as they affirm that the body and blood of Christ are materially present in the sacrament of the Lord's Supper, though in an incomprehensible manner; and likewise represent some religious rites and institutions, such as the use of images in churches, the distinguishing vestments of the clergy, the private confession of sins, the use of wafers in the administration of the Lord's Supper, the form of exorcism in the celebration of baptism, and other ceremonies of a similar kind, as tolerable, and some of them as useful. With regard to the divine decrees, the Lutherans maintain that they respect the salvation or misery of men, in consequence of a previous knowledge of their sentiments and characters, and not as free and unconditional, and as founded on the mere will of God. Towards the close of the last century, the Lutherans began to entertain a greater liberality of sentiment than they had before adopted; although in many places they persevered longer in severe and despotic principles than other Protestant churches. Their public teachers now enjoy an unbounded liberty of dissenting from the decisions of those symbols or creeds which were once deemed almost infallible rules of faith and practice, and of declaring their dissent in the manner which they judge the most expedient. Mosheim attributes this change in their sentiments to the maxim which they generally adopted, that Christians were accountable to God alone for their religious opinions; and that no individual could be justly punished by the magistrate for his erroneous opinions, whilst he conducted himself as a virtuous and obedient subject, and made no attempts to disturb the peace and order of civil society.

LUTHERN, in *Architecture*, a kind of window over the cornice, in the roof of a building, standing perpendicularly over the naked of a wall, and serving to illuminate the upper story. Lutherns are of various forms; as square, semicircular, round, and so forth.

LUTON, a town of Bedfordshire, in the hundred of Flitt, thirty-one miles from London, and situated on the river Lea. There is a good market-house and a church, with a singular steeple formed of flints and freestone. Near it is the fine seat of the Marquis of Bute. It has some trade in thread-lace and straw-plait. The inhabitants amounted in 1801 to 3095, in 1811 to 3716, in 1821 to 4529, and in 1831 to 5693.

LUTTERWORTH, a market-town of the county of Leicester, in the hundred of Guthlaxton, eighty-nine miles from London, and near the ancient Roman Watling Street Road. It is not a place of much trade, but is distinguished as the residence of Wickliffe, the father of English Protestantism, who was priest of this place, and died here in 1387; and his doctrines were condemned by the council of Constance in 1418, in consequence of which his bones were taken from the grave, burned, and thrown into the river, in 1428. The pulpit from which he preached is still preserved as a valuable relic. There is a market which is held on Thursday. The population amounted in 1801 to 1652, in 1811 to 1845, in 1821 to 2102, and in 1831 to 2262.

LUXATION, is when any bone is moved out of its place of articulation, so as to impede or destroy its proper office or motion. See SURGERY.

LUXEMBURG, a grand duchy of Germany, under the government of the house of Orange Nassau. Before the French revolution, it comprehended the two duchies of Luxemburg and Bouillon; but on being conquered by France, it was divided by that power between the department of the Ardennes and that of the Forests. In consequence of the treaty of 1815 it assumed the present form. It extends in north latitude from 49. 26. to 50. 16. and in east longitude from 5. 1. to 6. 29., and contains 2378 square miles. At present it is bounded on the north by the province of Liège in the Netherlands, on the east by the Prussian province of the Lower Rhine, on the south and south-west by the French departments of the Moselle, the Meuse, and the Ardennes, and on the north-west by the Netherland province Namur. It is divided into three circles, and these into twenty-five cantons and 314 communes, with 255,600 inhabitants, who are partly Germans and partly Walloons, and all adhere to the Roman Catholic church. The surface is filled with hills and a few secondary mountains, and many extensive woods and heaths. The most pleasing and fruitful valleys are those in the arrondissement of the capital; the poorest and wildest, in that of Neufchatel. The chief river is the Moselle, which conveys to the Rhine the water of most of the smaller streams. The Ourthe rises in this province, but is an inconsiderable river till it enters France. The agriculture is in a backward state, and produces little corn, and that chiefly rye and winter barley; and though the cultivation of potatoes has been much extended, some importation is necessary to supply food in every year. The breed of horses is considerable, and though they are of small size, they are strong and active, and fit to mount light troops. The sheep are numerous, and the flesh of them of excellent flavour; but the wool is for the most part indifferent, though of late years some flocks have been improved by crosses with the Merino race. Fruit is abundant; a little wine is made, and a good quantity of cider from the apples and pears, from both of which, as well as from corn, much brandy is distilled. The iron mines afford employment to the population when their labours can be spared from the laborious work which their poor soil requires. The produce of the metal is about 10,000 tons yearly, which is mostly sent out of the duchy in a raw state, although the state of the roads is such as to make conveyance very expensive, except when from frost there is no other employment for the horses and men. A large quantity of slates for roofing houses is furnished, and in some parts the marshy spots supply much turf for fuel. The manufacturing industry is almost confined to linen spinning and weaving, and to making paper. The common articles of clothing and furniture are generally made within each department. The capital is the city of Luxemburg, one of the garrison towns of the German confederation, and commonly occupied by the troops of some of its members, most commonly Prussians. It is one of the most formidable fortresses in the world, both from the nature of its position, and the vast labour which has been applied to strengthen its natural capability of defence. The civil inhabitants are 9500, in 1500 houses, and depend partly on the money spent by the garrison, and partly on manufactures, the principal of which is tanning leather, and making glue, paper, and tobacco. The river Alzette or Elze runs by the fortifications, and supplies water to the inhabitants. Long. 6. 4. E. Lat. 49. 37. N.

LUXEMBURG, *François Henry de Montmorency*, duke of, and marshal of France, a renowned general in the service of Louis XIV. was born in 1628. He was with the Prince of Condé at the battle of Rocroi in 1643; and in 1668 he distinguished himself at the conquest of Franche Compté. In 1672 he commanded in chief the French army in Holland, when he defeated the enemy near Woerden and Bodegrave; and he was universally admired for the fine retreat which he effected in 1673. He became marshal of France in 1675; gained the battle of Fleurs in 1690, that of Steenkirk in 1692, and that of Nerwinde in 1693. He died at Versailles in 1695.

LUXEUIL, a city in the department of the Upper Saone, and arrondissement of Lure, in France. It is situated in a woody valley on the banks of the Breuchin, and is celebrated for its warm baths, as well as for a spring strongly impregnated with iron, all of which are much visited by invalids. About a quarter of a mile from the town are the remains of some magnificent baths constructed by the Romans. It contains 310 houses and 3200 inhabitants. Long. 6. 19. E. Lat. 47. 50. N.

LUXURIANS FLOS, a luxuriant or double flower, some of the parts of which are increased in number, to the diminution or entire exclusion of others.

The parts which are augmented or multiplied in luxuriant flowers, are the flower-cup and petals, which Linnæus considers as the teguments or covers of the flower; the parts which are diminished or entirely excluded are the stamina or chives, which the same author denominates the male organs of generation.

Luxuriance in flowers is capable of the three following varieties. 1. A flower is said to be multiplied (*flos multiplicatus*) when the increase of the petals is not such as to exclude all the stamina. In this sense, flowers are properly said to be double, triple, or quadruple, according to the number of multiplications of the petals. 2. A flower is said to be full (*flos plenus*) when, by the multiplication of the petals, all the stamina are excluded. Such are most of the double flowers which engage the attention of florists. 3. A flower is said to be prolific (*flos prolifer*) which produces flowers, and sometimes leaves, from its centre.

Many natural orders of plants do not in any circumstances produce luxuriant flowers. Of this kind are the masked flowers of Tournefort, excepting calf's-snout; and the rough-leaved, umbelliferous, starry plants, and such as flower at the joints, of Ray. Some umbelliferous flowers, however, are *prolific*. The pea-bloom or butterfly-shaped flowers are rarely rendered double; some instances, however, of luxuriance are observed in a species of lady's finger, coronilla, and broom.

All luxuriant flowers are vegetable monsters. Such as are perfectly full, by which we mean the greatest degree of luxuriance, cannot be propagated by seeds, because these, for want of impregnation, can never ripen. Full flowers therefore are very properly denominated by Linnæus *eunuchs*. This highest degree of luxuriance is very common in carnation, lychnis, anemone, stock, Indian cress, rose, marsh marigold, ranunculus, violet, peony, and narcissus.

Flowers which do not exclude all the stamina perfect their seeds. Of this kind are poppy, fennel-flower, campanula, and some others. Some flowers, as those of the water-lily, fig-marigold, and cactus, have many rows or series of petals, without the number of stamina being in the least diminished. Such flowers are not to be reckoned luxuriant in the slightest degree. Luxuriance in flowers is generally owing to excess of nourishment.

LUXURY, voluptuousness, or an extravagant indulgence in diet, in dress, and in equipage.

Luxury, amongst the Romans, prevailed to such a degree that several laws were made to suppress, or at least restrict it. The extravagance of the table commenced about the time of the battle of Actium, and continued in great excess until the reign of Galba. Peacocks, cranes of Malta, nightingales, venison, wild and tame fowl, were considered as delicacies. A profusion of provisions was the reigning taste. Whole wild boars were often served up, and sometimes they were filled with various small animals, and birds of different kinds; a dish which they called the *Trojan horse*, in allusion to the wooden horse filled with soldiers. Fowls and game of all sorts were served up in pyramids, piled up in dishes as broad as moderate tables. Lucullus had a particular name for each apartment; and in whatever room he ordered his servants to prepare the entertainment, they knew by the direction the expense to which they were to go. When he supped in the Apollo, the expense was fixed at 50,000 drachmæ, that is L.1250. Marc Antony provided eight boars for twelve guests. Vitellius had a large silver platter, called *Minerva's Buckler*, which is said to have cost a million of sesterces. In this he blended together the livers of gilt-heads, the brains of pheasants and peacocks, the tongues of phenicopters, and the milts of lampreys. Caligula served up to his guests pearls of great value dissolved in vinegar; and the same was also done by Clodius the son of Æsop the tragedian. Apicius laid aside ninety millions of sesterces, besides a mighty revenue, for no other purpose but to be sacrificed to luxury; but finding himself involved in debt, he looked over his accounts, and though he had the sum of ten millions of sesterces still left, he poisoned himself from fear of being starved to death.

The Roman laws to restrain luxury were the *Leges Orchia, Fannia, Didia, Licinia, Cornelia*, and many others. But all these were unavailing; for as riches increased amongst them, so did sensuality.

What were the ideas of luxury entertained in England about two centuries ago, may be gathered from the following passage, contained in a discourse prefixed to Holinshed's Chronicles. " Neither do I," says the writer of this discourse, " speak this in reproach of any man, God is my judge; but to show, that I do rejoice, rather to see how God has blessed us with his good gifts, and to behold how that in a time wherein all things are grown to the most excessive prices, we yet do find means to obtain and atchieve such furniture as heretofore was impossible. There are old men yet dwelling in the village where I remain, which have noted three things to be marvellously altered in England within their sound remembrance. One is the multitude of chimneys lately erected; whereas in their young days there were not above two or three, if so many, in most uplandish towns of the realm (the religious houses, and manor places of their lords, always excepted, and peradventure some great personages), but each made his fire against a reredoss [screen] in the hall, where he dressed his meat and dined. The second is the great amendment of lodging; for, said they, our fathers and we ourselves have lain full oft upon straw pallets covered only with a sheet, under coverlits made of a dogswaine or horharriots (to use their own terms), and a good log under their head instead of a bolster. If it were so that the father or goodman of the house had a mattrass, or flock bed and sheets, with a sack of chaff to rest his head upon, he thought himself to be as well lodged as the lord of the town. So well were they contented, that pillows (said they) were thought meet only for women in childbed; as for servants, if they had any sheet above them, it was well; for seldom had they any under their bodies to keep them from pricking straws, that ran oft through the canvas and their hardened hides. The third thing they tell of, is the exchange of treene [wooden] platters into pewter, and wooden spoons into silver or tin; for so common were all sorts of treene vessels in old times, that a man should hardly find four pieces pewter (of which one was peradventure a salt) in a good farmer's house. Again, in times past, men were contented to dwell in houses builded of sallow, willow, &c. so that the use of oak was in a manner dedicated wholly unto churches, religious houses, princes palaces, navigation, &c. But now willow, &c. are rejected, and nothing but oak anywhere regarded; and yet see the change, for when our houses were builded of willow, then had we oaken men; but now that our houses are come to be made of oak, our men are not only become willow, but a great many altogether of straw, which is a sore alteration. In these the courage of the owner was a sufficient defence to keep the house in safety; but now the assurance of the timber must defend the men from robbing. Now have we many chimneys, and yet our tenderlins complain of rheums, catarrhs, and poses; then had we none but reredoses, and our heads did never ache. For as the smoke in those days were supposed to be sufficient hardening for the timber of the house; so it was reputed a far better medicine to keep the goodman and his family from the quacks or pose; wherewith, as then, very few were acquainted. Again, our pewterers in time past employed the use of pewter only upon dishes and pots, and a few other trifles for service; whereas now they are grown into such exquisite cunning, that they can in a manner imitate by infusion any form or fashion of cup, dish, salt, bowl, or goblet, which is made by the goldsmith's craft, though they be ever so curious and very artificially forged. In some places beyond the sea, a garnish of good flat English pewter (I say flat, because dishes and platters in my time began to be made deep, and like basons, and are indeed more convenient both for sauce and keeping the meat warm) is esteemed so precious as the like number of vessels that are made of fine silver."

Particular instances of luxury, in eating, however, might be produced from an earlier period, and would be found to surpass even the extravagance of the Romans. Thus, in the tenth year of the reign of Edward IV., 1470, George Nevill, brother to the Earl of Warwick, at his instalment into the archiepiscopal see of York, entertained most of the nobility and principal clergy, when his bill of fare was 300 quarters of wheat, 350 tuns of ale, 104 tuns of wine, a pipe of spiced wine, eighty fat oxen, six wild bulls, 1004 weathers, 300 hogs, 300 calves, 3000 geese, 3000 capons, 300 pigs, 100 peacocks, 200 cranes, 200 kids, 2000 chickens, 4000 pigeons, 4000 rabbits, 204 bitterns, 4000 ducks, 200 pheasants, 500 partridges, 200 woodcocks, 400 plovers, 100 curlews, 100 quails, 1000 egrets, 200 rees, 400 bucks, does, and roebucks, 1506 hot venison pasties, 4000 cold ditto, 1000 dishes of jelly parted, 4000 dishes of jelly plain, 4000 cold custards, 2000 hot custards, 300 pikes, 300 breams, eight seals, four porpuses, 400 tarts. At this feast the Earl of Warwick was steward, the Earl of Bedford treasurer, and Lord Hastings comptroller, with many more noble officers; and there were 1000 servitors, 62 cooks, 515 menial apparitors in the kitchen. But such was the fortune of the man, that after his extreme prodigality, he died in the most abject but unpitied poverty, *vinctus jacuit in summa inopia.*

And as to *dress*, luxury in that article seems to have attained a great height long before Holinshed's time. For in the reign of Edward III. we find no fewer than seven sumptuary laws passed in one session of parliament to restrain it. It was enacted, that men-servants of lords, as also of tradesmen and artisans, shall be content with one meal of fish or flesh every day; and the other meals, daily, shall be of milk, cheese, butter, and the like. Neither shall they use any ornaments of gold, silk, or embroidery; nor their wives and daughters any veils above the price of twelvepence. Artisans and yeomen shall not wear cloth above 40s. the whole piece (the finest then being about L.6 per piece), nor the ornaments before named;

nor the women any veils of silk, but only those of thread made in England. Gentlemen under the degree of knights, not having L.100 yearly in land, shall not wear any cloth above $4\frac{1}{2}$ marks the whole piece. Neither shall they or their females use cloth of gold, silver, or embroidery. But esquires having L.200 per annum or upwards of rent may wear cloths of five marks the whole piece of cloth; and they and their females may also wear stuff of silk, silver, ribbons, girdles, or furs. Merchants, citizens, burghers, and artificers or tradesmen, as well of London as elsewhere, who have goods and chattels of the clear value of L.500, and their females, may wear as is allowed to gentlemen and esquires of L.100 per annum. And merchants, citizens, and burgesses, worth above L.1000 in goods and chattels, and their females, may wear the same as gentlemen of L.200 per annum. Knights of 200 marks yearly may wear cloth of six marks the cloth, but no higher; but no cloth of gold, nor furred with ermine: but all knights and ladies having above 400 marks yearly, up to L.1000 per annum, may wear as they please, ermine excepted; and they may wear ornaments of pearl and precious stones for their heads only. Clerks having degrees in cathedrals, colleges, may wear as knights and esquires of the same income. Ploughmen, carters, shepherds, and such like, not having 40s. value in goods or chattels, shall wear no sort of cloth but blanket and russet lawn at 12d. and shall wear girdles and belts; and they shall only eat and drink suitable to their stations. And whosoever uses other apparel than is prescribed by the above laws shall forfeit the same.

Concerning the general utility of luxury to a state, there is much difference of opinion amongst political writers. Montesquieu asserts, that luxury is necessary to monarchies, as in France, but that it is ruinous to democracies, as in Holland. With regard, therefore, to Britain, whose government is compounded of both species, it is held to be a dubious question, how far private luxury is a public evil, and, as such, cognizable by public laws; and indeed our legislators have several times changed their sentiments as to this point; for formerly there were a number of penal laws existing to restrain excess in apparel, chiefly made in the reigns of Edward III. IV. and Henry VIII. a specimen of which we have inserted above. But all of them it appeared expedient to repeal at an after period. In fact, although luxury will of necessity increase according to the influx of wealth, it may not be for the general benefit of commerce to impose, as in the above-cited laws, an absolute prohibition of every degree of it; yet, for the good of the public, it may be necessary that such as go beyond proper bounds in eating, drinking, and wearing what by no means is suitable to their station, should be taxed accordingly, could it be done without including those who have a better title to such indulgence. This is certainly, however, a point which should be maturely weighed before it be executed; and, in mercantile countries at least, such restraints may be found prejudicial, most likely impracticable, especially where true liberty is established. Sir William Temple observes, speaking of the trade and riches, and at the same time of the frugality, of the Hollanders, "That some of our maxims are not so certain as current in politics; as that encouragement of excess and luxury, if employed in the consumption of native commodities, is of advantage to trade. It may be so to that which impoverishes, but not to that which enriches, a country. It is indeed less prejudicial if it lies in native than in foreign wares; but the humour of luxury and expense cannot stop at certain bounds; what begins in native will proceed to foreign commodities; and though the example arise among idle persons, yet the imitation will run into all degrees, even of those men by whose industry the nation subsists. And besides, the more of our own we spend, the less shall we have to send abroad; and so it will come to pass, that while we drive a vast trade, yet, by buying much more than we *sell*, we shall come to be poor at last."

LUZIN, a circle of the Russian province Witebsk, extending in north latitude from 55. 55. to 57. 15. and in east longitude from 27. 1. to 27. 29. It contains one city and 1227 villages, with 32,300 inhabitants. The capital is a small town of the same name, situated on the river Welika, 390 miles from St Petersburg. Long. 38. 35. E. Lat. 56. 35. N.

LUZK, a circle of the province of Volhynia, in Russia, extending in north latitude from 50. 33. to 51. 34. and in east longitude from 25. 4. to 25. 37. The northern part is marshy, the southern very fertile. The capital is a city of the same name, situated on the river Styr, 1126 miles from St Petersburg. It contains one Catholic and several Greek churches, 600 houses, and 3150 inhabitants. Long. 25. 5. E. Lat. 50. 44. N.

LUZON, Lucon, or Luconia, one of the Philippine islands, and the largest of the whole group, situated between the thirteenth and nineteenth degrees of north latitude, and extending from the 120th to the 124th degrees of east longitude. It is 400 miles in length, by 115 in average breadth. The greater part of this island is mountainous, being intersected in its whole length from north to south by an elevated chain, from which diverge various ramifications and detached mountains of a conical figure, in the midst of extensive plains. The soil is remarkably fertile, and the climate for the most part moist; but it is temperate, considering the situation of the island within the tropics. It yields cotton, indigo, sugar, tobacco, and generally all sorts of tropical produce, the richest fruits of the West as well as of the East Indies, and, with ordinary industry, would rival the Moluccas in the production of spices and precious aromatics. In the mountains are found wild cinnamon, nutmegs, ebony, sandal wood, together with excellent timber for building and shipping. Gold is washed down from the higher grounds, and is found among the sands and mud of its rivers, brooks, and lakes. Civet cats are common, and ambergris is thrown on the coast in prodigious quantities. There are several volcanoes on the island, and many warm springs and small lakes, indicating an internal combustion, from which probably originate the earthquakes to which the island is subject. In 1650 one of these earthquakes overturned almost all the city of Manilla; and in 1754 another took place, which was attended with the most destructive effects. The coast is indented by many bays and commodious harbours; that of Manilla is the finest in the world, and is the only one frequented by ships of burden. The Spaniards on their arrival found upon the coast a nation of Moors, who called themselves Tagalians, and were Malayans by descent. They are for the most part a quiet and tractable people. After their conquest by the Spaniards they were most cruelly oppressed by monopolies and other tyrannical restraints; the population of the country was diminished, agriculture discouraged, and the inhabitants, destitute of any motive to energy, have sunk into indolence. Manilla is the capital. The population is estimated at 900,000, though nothing certain is known on this subject.

LYBIA, or Libya, a name anciently given to all that part of Africa lying between the borders of Egypt and the river Triton, and comprehending *Cyrenaica*, *Marmarica*, and the *Regio Syrtica*. See Ethiopia.

LYCÆUM, Λυκειον, in *Antiquity*, the name of a celebrated school or academy at Athens, where Aristotle explained his philosophy. The place was composed of porticos and trees planted in the quincunx form, where the philosophers disputed walking. Hence the philosophy of the Lycæum is used to signify the philosophy of Aristotle, or the peripatetic philosophy. Suidas observes, that the Lycæum took its name from its having been originally a temple of Apollo Lycæus, or rather a portico or gallery built by Lycæus, son of Apollo; but others state that it had been built either by Pisistratus or by Pericles.

LYCAON, in fabulous history, the first king of Arcadia, son of Pelasgus and Melibœa. He built a town called Lycosura, upon the top of Mount Lycæus, in honour of Jupiter. He had many wives, by whom he had a daughter called Callisto, and fifty sons. He lived about 1820 years before the Christian era, and was succeeded on the throne by Nyctimus, the eldest of his sons. This is also the name of another king of Arcadia, celebrated for his cruelties. He was changed into a wolf by Jupiter, because he had offered human victims upon the altar of the god Pan. Some attribute this metamorphosis to another cause. The sins of mankind, as they relate, had become so enormous, that Jupiter, having visited the earth in order to punish its impiety and wickedness, came to Arcadia, where he was announced as a god, and the people began to pay proper adoration to his divinity. But Lycaon, who used to sacrifice all strangers to his wanton cruelty, laughed at the pious prayers of his subjects, and, to try the divinity of the god, he served up human flesh on his table. This impiety so irritated Jupiter that he immediately destroyed the house of Lycaon, and changed him into a wolf.

LYCIA, a country of Asia Minor, bounded by the Mediterranean on the south, by Caria on the west, by Pamphylia on the east, and by Phrygia on the north. It was anciently called *Milyas* and *Tremile*, from the Milyæ or Solymi, a people of Crete, who came to settle there. The country received the name of *Lycia* from Lycus, the son of Pandion, who there established himself. The inhabitants have been greatly commended by all the ancients for their sobriety and justice. They were conquered by Crœsus, king of Lydia, and afterwards by Cyrus. Though they were subject to the power of Persia, yet they were governed by their own kings, and only paid a yearly tribute to the Persian monarch. When Alexander marched into the East, they became part of the Macedonian empire, and afterwards were ceded to the house of the Seleucidæ. The country was reduced into a Roman province by the Emperor Claudius.

LYCODONTES, the petrified teeth of the lupus-piscis, or wolf-fish, frequently found in a fossil state. They are of different shapes; but the most common kind swell out in a semi-orbicular form, and are hollow within, somewhat resembling an acorn-cup. This hollow is found sometimes empty, and sometimes filled with the stratum in which it was imbedded. Many of them have an outer circle of a different colour from the rest.

LYCOMEDES, in fabulous history, a king of Scyros, an island in the Ægean Sea. He was son of Apollo and Parthenope, and was secretly intrusted with the care of young Achilles, whom his mother Thetis had disguised in woman's clothes, in order to prevent him proceeding to the Trojan war, where she knew he must unavoidably perish. Lycomedes rendered himself famous for his treachery to Theseus, who had implored his protection when driven from the throne of Athens by the usurper Mnestheus. Lycomedes, as is reported, either envious of the fame of his illustrious guest, or bribed by the emissaries of Mnestheus, led Theseus to an elevated place, on the pretence of showing him the extent of his dominions, and perfidiously threw him down a precipice, by which means he was killed.

LYCON, a philosopher of the school of Aristotle, was a native of Loadicea, in Phrygia. He was born B. C. 300, and died, at the age of seventy-four, B. C. 226. Upon the death of Strato, Lycon became the head of the Aristotelian sect (B. C. 270), and taught the school at Athens which had been conducted successively by Aristotle, Theophrastus, and Strato, whom he succeeded. We are informed by Diogenes Laertius, in his life of this philosopher, that he was particularly successful in directing the studies of youth; and that he regarded corporal punishment as not only useless, but positively injurious, holding, that youth ought to be directed by feelings of honour and shame, as a horse is by the spur and reins. His eloquence was full of mild persuasion, and so melodious, that his contemporaries prefixed the letter *G* to his name, making it Glycon, which signifies *sweetness.* He was much esteemed by Attalus and Eumenes I. kings of Pergamus; and Antiochus, king of Syria, did every thing in his power to prevail on him to remain at his court. He conducted the school with great ability during upwards of forty-two years, and was succeeded by Aristo Ceus (Plut. *Mor.* p. 605, B.). The last will of Lycon is given by Diogenes, and exhibits a strong proof of the kindness and goodness of his nature.

LYCOPHRON, a Greek poet, was a native of Chalcis, a city in the island of Eubœa, and the son of Socles; but of his private history we are almost entirely ignorant. It is supposed that Lycophron began to be distinguished in the beginning of the reign of Philadelphus, B. C. 280, and continued to rise in reputation till B. C. 250, during the first years of the first Punic war, a period of thirty years. If we be correctly informed respecting the mode in which he acquired the friendship and favour of Ptolemy Philadelphus, who then held his court at Alexandreia, it is not much to the credit of Lycophron. It is said that he owed it to the flattering compliments he contrived to convey to the prince through ingenious anagrams. Thus, from Πτολεμαιος, he made ἀπο μελιτος (*of honey*); in Arsinoe, the name of the queen, he found ἰον Ἡρας (*violet of Juno*). Lycophron is included amongst those seven poets who from their number were called the Pleias. They were all contemporary, and all graced the court of Philadelphus. Their names were, Homerus, Sositheus, Lycophron, Alexander (Ætolus), Philiseus, Sosiphanes or Dionysides, and Æantides. Lycophron was the author of sixty-four, or, according to others, of forty-six, tragedies (Tzetzes *ad Lyc.* p. 270). Suidas gives the names of nineteen of them. They have all however disappeared, and the only fragment of them that has been preserved is a verse of four lines of his tragedy entitled *Pelopidæ*, by Stobæus. The idea is beautiful, and is expressed with great simplicity. "The unhappy call upon death to relieve them while he is at a distance; but when the last moments of life approach, we are anxious to live. Man is never tired of life." Lycophron is also said to have been the author of satires, one of which, directed against Menedemus, and where he ridiculed the frugal table of this founder of the Eretrian school, has been particularly mentioned. (*Athen.* x. p. 420; xi. p. 55.) He also wrote some books on comedy; but the work which has been preserved, and for which he is best known, is entitled *Alexandra* or *Cassandra*, from the daughter of Priam, who had two appellations, like her brother Paris. The poem consists of 1474 lines. Cassandra had acquired by a trick the power of prophecy from Apollo; but, having refused to fulfil her engagement, the god prevented any credit being attached to her words, and caused her to be regarded as mad. She is shut up in a tower by Priam, that she may not alarm the city, and from the summit of the tower she observes the vessel depart which bore Paris to the shores of Greece. This spectacle excites her prophetic powers, and a servant who overhears her words repeats them to Priam. She commences by deploring the fate which she foresees must inevitably overtake her native city, and then proceeds to foretell the various calamities which will arise out of the Trojan war. She first recounts those which will befall Helen, her parents, brothers, and sisters; and then notices the fates of the different Grecian leaders, such as Ajax, Diomede, Menelaus, Agamemnon, and Idomeneus. This causes her to

Lycurgia
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Lycurgus.

refer to the numerous wars which had been carried on at various times between the inhabitants of Europe and Asia. She begins with the rape of Io and Europa, and, giving an historical sketch of the Argonauts, the Amazons, the Trojans, Midas, and Xerxes, she brings down her history to the time of Alexander the Great. Besides, there are many episodes scattered throughout the work, such as the Labours of Hercules, the Deluge of Deucalion, the Wanderings of Æneas, and the colony planted in Latium. This work of Lycophron is one of the most obscure which antiquity has handed down to us, and it appears that the author exerted all his ingenuity to render it so. He has succeeded principally by the employment of unusual modes of syntax, of rare and obsolete words, of expressions far removed from the common dialect, of confused metaphors, and of periods so involved that the reader loses himself in a labyrinth of words. There have been many commentaries on the Alexandra, but the best is that by Tzetzes. The best edition is that of Potter (Oxford, 1697, 1702), in which the text is accompanied by the scholia of Tzetzes, the remarks of Canter and Meursius, and a valuable index. Reichard (Lip. 1788), rejecting the commentaries of Tzetzes, Meursius, and Potter, published the simple text and notes of Canter, adding a continued paraphrase like that which is found in the editions of the classics ad usum Delphini. The Scholia have been published separately by Müller (3 vols. Lips. 1811), Royston translation.

LYCURGIA, a festival observed by the Spartans, in memory of their lawgiver Lycurgus, whom they honoured with a temple and an annual sacrifice.

LYCURGUS, the celebrated legislator of the Spartans, was the son of Eunomes, king of Sparta. He travelled in Greece, the island of Crete, Egypt, and even proceeded to the Indies, to converse with the sages and learned men of those countries, and to learn their manners, customs, and laws. After the death of his brother Polydectes, who was king of Sparta, his widow offered the crown to Lycurgus, promising that she would cause herself to miscarry of the child of which she was pregnant, provided he would marry her; but Lycurgus nobly refused these advantageous offers, and afterwards contented himself with being tutor to his nephew Charillus, whom he restored to the government when he came of age. Notwithstanding this honourable and generous conduct, however, he was accused of a design to usurp the crown. This calumny obliged him to retire to the island of Crete, where he applied himself to the study of the laws and customs of nations. On his return to Lacedæmon, he reformed the government, and, to prevent the disorders occasioned by luxury and the love of riches, he prohibited the use of gold and silver; placed all the citizens in a state of equality; and introduced the strictest temperance, the most exact discipline, and those remarkable laws which, with few exceptions, have been celebrated by all historians. It is said, that, to engage the Lacedæmonians to observe them inviolably, he made them promise upon oath not to change any part of them till his return; and that he afterwards went to the island of Crete, where he killed himself, having ordered that his ashes should be thrown into the sea, from fear lest, if his body should be carried to Sparta, the Lacedæmonians would think themselves absolved from their oath. He flourished about 870 B. C.

LYCURGUS, one of the most celebrated orators of Greece, was born at Athens about the year B. C. 400, and died about B. C. 323. He was son of Lycophron, and grandson of Lycurgus, one or other of whom was put to death by the Thirty Tyrants, B. C. 404 (Phot. *Cod.* cclxviii. p. 1483). In his early years he studied philosophy under Plato, and the political constitution of his country under Isocrates. At what period he entered upon public life is nowhere recorded, but we find him, B. C. 343, appointed, along with Demosthenes, one of the ambassadors to counteract the proceedings of Philip in different parts of Greece (Demosth. *Philipp.* iii. p. 129). So much confidence had his fellow-citizens in his integrity, that he continued to preside over the collection of the public revenue for twelve or fifteen years. After the defeat of the Greeks at the battle of Chæronea, B. C. 338, he brought Lysicles, the general of the Athenians on that occasion, to trial before the people, and procured his condemnation (Diodor. Sicul. xvi. 88). He restored the credit of comic exhibitions at the Lenæan festival, and enacted honours for the three great tragic poets (*Vit.* x. Or. p. 841). Lycurgus was one of the orators demanded by Alexander, after the destruction of Thebes, B. C. 335; but the Athenians refused to give him up (Plut. *Demosth.* c. 23; Arrian, *Exp.* i. 10). It would appear that Lycurgus died about the time of the exile of Demosthenes, B. C. 323, the year before that orator's death (*Vit.* x. Or. p. 842). There were fifteen orations of Lycurgus extant in the time of Plutarch and Photius, but only one has been preserved (against Leocrates), which was delivered B. C. 330. It is published by Hauptmann (Lips. 1751), by Schulze (Bruns. 1789), by Osann (Jena, 1821), and, along with other fragments, by Bekker (Magdeb. 1821).

Lydd
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Lydia.

LYDD, a market-town of the county of Kent, in the hundred of Langport and lathe of Shepway, seventy-three miles from London. It is in a low situation, on Romney Marsh; and is a member of the Cinque Ports, near the sea. It has a small market, which is held on Thursday. The population amounted in 1801 to 1303, in 1811 to 1504, in 1821 to 1437, and in 1831 to 1357.

LYDGATE, JOHN, surnamed the *Monk of Bury*, not, as Cibber conjectures, because he was a native of that place, for he was born about the year 1380, in the village of Lydgate, but because he was a monk of the Benedictine convent at St Edmund's-Bury. After studying some time in the English universities, he travelled into France and Italy; and, having thus acquired a competent knowledge of the languages of those countries, he returned to London, where he opened a school, in which he instructed the sons of the nobility in polite literature. At what time he retired to the convent of St Edmund's-Bury, does not appear; but he was certainly in that establishment in the year 1415. He was alive in 1446, when he must have been about sixty-six years of age; but in what year he died is not known. Lydgate, according to Pits, was an elegant poet, a persuasive rhetorician, an expert mathematician, an acute philosopher, and a respectable divine. He was a voluminous writer, and, considering the age in which he lived, an excellent poet. His language is less obsolete, and his versification more harmonious, than the language and versification of Chaucer, who wrote about half a century before his time. His works are, 1. History of the Theban War, printed at the end of Chaucer's works, 1561, 1602, 1687; 2. Poemation of Good Counsel, at the end of Chaucer's works; 3. The Life of Hector, London, 1594, folio, printed by Gross, and dedicated to Henry V.; 4. Life of the Blessed Virgin, printed by Caxton; 5. The Proverbs of Lydgate upon the fall of princes, printed by Winkyn de Worde, London, 4to; 6. Dispute of the Horse, the Sheep, and the Goose, printed in Caxton's Collect. 4to; 7. The Temple of Brass, amongst the works of Chaucer; 8. London Lickpenny (vide Stow's *History*); besides an incredible number of other poems and translations preserved in various libraries.

LYDIA, in *Ancient Geography*, a celebrated kingdom of Asia Minor. The ancient writers inform us, that Lydia was first called *Mæonia* or *Meonia*, from Meon, king of Phrygia and Lydia; and that it was known under no other denomination until the reign of Atys, when it began to be called *Lydia*, from his son Lydus. Bochart, finding in his learned collection of Phœnician words the verb *Luz*, signifying "to wind," and observing that the country we are speaking of is watered by the Mæander, so famous for its windings, concludes that it was thence named *Ludia* or *Lydia;* but this, it must be obvious, is too fanciful and remote a derivation to be the true one. As to the ancient name of Mæonia, he takes it to be a Greek translation of the Phœnician word *lud*, in which he agrees in some measure with Stephanus, who derives the name of Mæonia from Mæon, the ancient name of the Mæander. Some take the word *Mæonia* to be a translation of a Hebrew word signifying metal, because, according to them, that country was in former times rich above any other with mines. Though Lydia and Mæonia are by most authors indifferently used for one and the same country, yet they are sometimes distinguished; that part including Mount Tmolus, and watered by the Pactolus, being properly called *Mæonia;* and the other, situated upon the coast, *Lydia*. This distinction is observed by Homer, Callimachus, Dionysius, and other ancient writers. In after ages, when the Ionians, who had planted a colony on the coast of the Ægean Sea, began to make some figure, that part was called *Ionia*, and the name of *Lydia* given to the ancient Mæonia. Lydia, according to Pliny, Ptolemy, and other ancient geographers, was bounded by Mysia Major on the north, by Caria on the south, by Phrygia Major on the east, and by Ionia on the west, and was situated between the thirty-seventh and thirty-ninth degrees of north latitude. But what the ancients style the kingdom of *Lydia* was not confined within these narrow boundaries; it extended from Halys to the Ægean Sea. Pliny's description includes Æolia, situated between the Hermus and the Caïcus.

As to the origin of the Lydians, Josephus, and after him all the ecclesiastical writers, derive them from Lud, Shem's fourth son; but this opinion has no other foundation than the similitude of names. Some of the ancients conceive the Lydians to have been a mixed colony of Phrygians, Mysians, and Carians; but others, finding some conformity in religion and religious ceremonies between the Egyptians and Tuscans, who were a Lydian colony, conclude, without further evidence, that they were originally Egyptians. All we know for certain is, that the Lydians were a very ancient nation; and this is manifest from their fables; for Atys, Tantalus, Pelops, Niobe, and Arachne, are all said to have been the children of Lydus. Zanthus, in his *Lydiaca*, quoted by Stephanus, informs us, that the ancient city of Ascalon, one of the five satrapies of the Philistines, mentioned in the books of Joshua and the Judges, was built by one Ascalus a Lydian, whom Achiamus, king of Lydia, had appointed to command a body of troops which he sent into Syria, we know not on what occasion. The Heraclidæ, or kings of Lydia descended from Hercules, began to reign before the Trojan war, and had been preceded by a long line of sovereigns sprung from Atys, and hence styled *Atyadæ;* a strong proof of the antiquity of that kingdom.

The Lydians began very early to be governed by kings, whose authority seems to have been despotic, and the crown hereditary. We read of three distinct races of kings reigning over Lydia; the Atyadæ, the Heraclidæ, and the Mermnadæ. The *Atyadæ* were so called from Atys the son of Cotys, and grandson of Manes the first Lydian king. But the history of this family is obscure and fabulous. The Atyadæ were succeeded by the *Heraclidæ*, or the descendants of Hercules. This hero having, by the direction of the oracle, been sold as a slave to Omphale, queen of Lydia, in order to expiate the murder of Iphitus, had, by one of her slaves, during his captivity, a son named Cleolaus, whose grandson Argon was the first of the Heraclidæ who ascended the throne of Lydia. This race is said to have reigned 505 years, the son succeeding the father for twenty-two generations. They began to reign about the time of the Trojan war. The last of the family was the unhappy Candaules, who lost both his life and kingdom by his imprudence. Of this event an account is given by Herodotus. Candaules had a wife whom he passionately loved, and believed to be the most beautiful of her sex. He extolled her charms to Gyges his favourite, whom he used to intrust with his most important affairs; and, to convince him the more of her beauty, resolved to show her to him quite undressed. He accordingly placed Gyges in the porch of the chamber where the queen used to undress when she went to bed, ordering him to retire after he should have seen her, and take the utmost possible care not to be observed. But notwithstanding all the caution he employed, she plainly discovered him going out; and though she did not doubt that it was her husband's contrivance, yet she passed that night in seeming tranquillity, suppressing her resentment till next morning, when she sent for Gyges, and resolutely told him that he must either by his death atone for the criminal action he had been guilty of, or put to death Candaules, the contriver of it, and receive both her and the kingdom of Lydia as his reward. Gyges at first earnestly begged of her that she would not drive him to the necessity of such a choice; but finding that he could not prevail with her, and that he must either kill his master or be killed himself, he chose the former part of the alternative. Being led by the queen to the same place where her husband had posted him the night before, he stabbed the king whilst he was asleep, married the queen, and took possession of the kingdom, in which he was confirmed by the response of the oracle of Delphi. But the Lydians having taken up arms to revenge the death of their prince, an agreement was made between them and the followers of Gyges, that if the oracle should declare him to be lawful king of Lydia, he would be permitted to reign; if not, that he should resign the crown to the Heraclidæ. The answer of the oracle proved favourable to Gyges, and he was universally acknowledged as lawful king of Lydia. Candaules is said to have purchased, for its weight in gold, a picture painted by Bularchas, representing a battle of the Magnetes; a circumstance which shows how early the art of painting had begun to be appreciated in that country, Candaules having been contemporary with Romulus.

Gyges, having thus possessed himself of the kingdom of Lydia, sent many rich and valuable presents to the oracle of Delphos, amongst which were six cups of gold, weighing thirty talents, and greatly esteemed for the workmanship. He made war upon Miletus and Smyrna, took the city of Colophon, and subdued the whole country of Troas. In his reign, and by his permission, the city of Abydus was built by the Milesians. Plutarch and other writers give a different account of his accession to the crown of Lydia, and inform us, without making any mention of the queen, that Gyges rebelled against Candaules, and slew him in an engagement. In Gyges commenced the third race called *Mermnadæ*, who were also, properly speaking, Heraclidæ, being descended from a son of Hercules by Omphale.

Gyges reigned thirty-eight years, and was succeeded on the throne by his son Ardyes. This prince carried on the war against the Milesians which his father had begun, and possessed himself of Priene, which in those days was a strong city. In his reign the Cimmerians invaded and overran all Asia Minor; but what battles were fought between the Lydians and these invaders, and with what success, we find nowhere mentioned. Herodotus only informs us, that in the time of Ardyes they possessed themselves of Sardis, the metropolis of Lydia, but that they failed to reduce the castle. Ardyes reigned forty-nine years, and was succeeded by his son Sadyattes, who reigned twelve years, during most part of which he carried on war with the Milesians.

After him came his son Alyattes, who for the space of five years continued the war which his father had begun against the Milesians, ravaging their country, and about harvest-time carrying away all their corn yearly, in order to oblige them, from want of provisions, to surrender their city, which he knew he could not reduce in any other way, the Milesians being at that time masters of the sea. In the twelfth year of this war the Lydians having set fire to the corn in the fields, the flames were carried by a violent wind, which happened at that time to blow, to the temple of Minerva at Assesus, and burned it down to the ground. Not long afterwards, Alyattes falling sick, sent to consult the oracle at Delphos; but the god refused to return any answer until the king should rebuild the temple of Minerva at Assesus. Alyattes, thus warned, despatched ambassadors to Miletus, enjoining them to conclude a truce with the Milesians until the temple should be rebuilt. On the arrival of the ambassadors, Thrasybulus, then king of Miletus, having commanded all the corn which was at that time in the city to be brought into the market-place, ordered the citizens to banquet in public, and to revel as if the city were plentifully stored with all manner of provisions. This stratagem Thrasybulus practised, that the ambassadors, seeing such quantities of corn, and the people everywhere diverting themselves, might acquaint their master with his affluence, and thus divert him from pursuing the war. As Thrasybulus had intended, so it happened. Alyattes, who believed the Milesians greatly distressed for provisions, receiving a different account from his ambassadors, changed the truce into a lasting peace, and ever afterwards lived in amity and friendship with Thrasybulus and the Milesians.

After a reign of fifty-seven years, he was succeeded by his son Crœsus, whose uninterrupted prosperity, in the first years of his reign, far eclipsed the glory of his predecessors. He was the first who made war on the Ephesians, whose city he besieged and took, notwithstanding their consecrating it to Diana, and fastening the walls by a rope to her temple, which was seven stadia distant from the city. After the reduction of Ephesus, he under various pretences attacked the Ionians and Æolians, obliging them, and all the other Greek states of Asia, to pay him an annual tribute. Having met with such extraordinary success by land, the Lydian prince determined to render his power equally conspicuous by sea. For this purpose he had serious thoughts of equipping a fleet, with which he purposed to invade and conquer the Grecian islands directly opposite to his dominions. But this design, which, considering the slow progress of maritime power amongst the nations most diligent in attaining it, would probably have failed of success, was prevented by the advice of a philosophical traveller, conveyed in such a lively turn of wit as easily changed the resolution of the king. Bias of Priene in Ionia (some say Pittacus of Mitylene in the isle of Lesbos), whilst he travelled, after the Grecian custom, from curiosity and a love of knowledge, was presented to Crœsus at the Lydian court; and being asked by that prince what news he brought from Greece, answered, with a republican freedom, that the islanders had collected powerful squadrons of cavalry with an intention of invading Lydia. "May the gods grant," said Crœsus, "that the Greeks, who are unacquainted with horsemanship, should attack the disciplined valour of the Lydian cavalry; there would speedily be an end to the contest." "In the same manner," replied Bias, "as if the Lydians, who are totally unexperienced in naval affairs, should invade the Grecians by sea." Struck by the acuteness of this unexpected observation, Crœsus desisted from his intended expedition against the islands; and, instead of employing new means for extending his conquests, determined peaceably to enjoy the laurels he had won, and to display the grandeur he had attained. But his happiness was soon afterwards allayed by the death of his favourite son Atys, who was unfortunately killed in the chase of a wild boar. This loss rendered him disconsolate for two years, and reduced him to a state of inaction, till the conquests of Cyrus, and the growing power of the Persians, roused up his martial spirit, and diverted his mind to other thoughts.

Crœsus apprehending that the success which had attended Cyrus in all his undertakings might at last prove dangerous to himself, resolved if possible to put a stop to his progress. In adopting this resolution, which might probably be attended with the most important consequences, he was desirous to learn the will of heaven concerning the issue of the war. The principal oracles which he consulted were those of Branchis in Ionia, of Ammon in Libya, and of Delphi in Greece. But, amongst these respected shrines, the oracle of Delphi maintained its ascendant, as the most faithful interpreter of fate. Crœsus was fully persuaded of its veracity; and, generously desirous to compensate the priests of Apollo for the trouble which he had already given, and still meant to give, he sacrificed three thousand oxen to the god, and adorned his shrine with gifts equally valuable for the workmanship and for the materials, viz. precious vessels of silver, ewers of iron beautifully inlaid and enamelled; various ornaments of pure gold, particularly a golden lion weighing ten talents, and a female figure three cubits or near five feet in height. In return for these magnificent presents, the oracle, in equivocal and ambiguous language, flattered Crœsus with obtaining an easy victory over his enemies, and with enjoying a long life and a prosperous reign. The god at the same time enjoined him to contract an alliance with the most powerful of the Grecian states.

Elevated with these favourable predictions of Apollo, Crœsus prepared to yield a ready obedience to the only condition required on his part for the accomplishment of his aspiring design. Not deeming himself sufficiently acquainted with the affairs of Greece to know what particular republic was meant by the oracle, he made especial inquiry of those who were best informed concerning the state of Europe, and discovered, that amongst all the members of the Grecian confederacy, the Athenians and Lacedæmonians were justly entitled to the pre-eminence. But in order to learn which of these communities deserved the epithet of "most powerful," it was necessary to send ambassadors into Greece. The Lydians despatched on this important commission soon discovered that the Athenians, having been long harassed by internal dissensions, were actually governed by the tyrant Pisistratus. The Spartans, on the other hand, though anciently the worst regulated of all the Grecian communities, had enjoyed domestic peace and foreign prosperity ever since they had adopted the wise institutions of Lycurgus. After that memorable period, they had repeatedly conquered the warlike Argives, triumphed over the hardy Arcadians, and, notwithstanding the heroic exploits of Aristomenes, subdued and enslaved their unfortunate rivals of Messene. To the Lydian ambassadors, therefore, the Spartan republic appeared to be pointed out by the oracle as the community whose alliance they were enjoined to solicit. Having accordingly repaired to Sparta, they were introduced not only to the kings and senate, but, as the importance of the negociation required, to the general assembly of the Lacedæmonians, to whom they, in few words, declared the object of their commission. "Lacedæmonians, we are sent by Crœsus, king of the Lydians and of many other nations, who being commanded by the oracle of Apollo to seek the friendship of the most powerful people of Greece, now summon you, who justly merit that epithet, to become his faithful allies, in obedience to the will of the god whose authority you acknowledge." The Lacedæmonians, pleased with the alliance of a warlike king, and still more with the fame of their valour, readily accepted the proposal. To the strict connection of an offensive and defensive league they joined the more respected ties of sacred hospitality. A few years before this transaction they had sent to Sardis to purchase gold for making a statue of Apollo, and on that occasion Crœsus had gratuitously supplied their wants. Remembering this generosity, they gave the Lydian ambassadors at their de-parture, as a present for their master, a vessel of brass containing three hundred amphoras (above twelve hogs-heads), and beautifully carved on the outside with various forms of animals.

Crœsus, having thus happily accomplished the design recommended by the oracle, was eager to set out upon his ntended expedition. He had formerly entered into alli-ances with Amasis king of Egypt, and Labynetus king of Babylon; and he had now obtained the friendship of the most warlike nation of Europe. The newly-raised power of Cyrus and the Persians seemed incapable of resisting uch a formidable confederacy. Elevated with these flat-ering ideas of his own invincible greatness, Crœsus wait-d not to attack the Persian dominions until he had col-ected the strength of his allies. The sanguine impetuosi-y of his temper, unexperienced in adversity, unfortunately recipitated him into measures no less daring than ruinous. Attended only by the arms of Lydia, and a numerous band f mercenaries, whom his immense wealth enabled him at ny time to call into his service, he marched towards the iver Halys, and, having with much difficulty crossed that eep and broad stream, entered the province of Cappado-ia, which formed the western frontier of the Median do-minions. That unfortunate country soon experienced all he calamities of invasion. The Pterian plain, the most eautiful and fertile district of Cappadocia, was laid waste; he ports of the Euxine, as well as several inland cities, were plundered, and the inoffensive inhabitants were either ut to the sword or dragged into captivity. Encouraged y the unresisting softness of the natives of those parts, Crœsus was eager to push forwards; and if Cyrus did not reviously meet him in the field, he had determined to pro-eed in triumph to the mountains of Persia. Against this angerous resolution he was in vain exhorted by a prudent ydian named Sandanis, who, when asked his opinion of he war, declared it with that freedom which the princes f the East have in every age permitted, amidst all the ride and caprices of despotic power, to men distinguished y the gifts of nature or education. "You are preparing," aid he, "to march against a people who lead a laborious nd a miserable life; whose daily subsistence is often de-ied them, and is always scanty and precarious; who drink nly water, and who are clothed with nothing but the skins f wild beasts. What can the Lydians gain by the conquest f Persia; the Lydians, who enjoy all the advantages of which the Persians are destitute? For my part, I deem it blessing of the gods that they have not excited the war-like poverty of these miserable barbarians to invade and plunder the luxurious wealth of Lydia." The moderation f this advice was rejected by the fatal presumption of Crœsus; confounding the dictates of experienced wisdom with the mean suggestions of pusillanimity, he dismissed he prudent counsellor with contempt, and prepared to pro-ecute his fatal enterprise.

Meanwhile, the approach of Cyrus, who was not of a temper to permit his dominions to be ravished with impu-ty, afforded the Lydian king an opportunity of bringing he war to a more speedy issue than by his intended ex-edition into Persia. The army of Cyrus gradually aug-ented as he advanced; the tributary princes cheerfully ontributing with their united strength towards the assis-ance of a master whose valour and generosity they ad-mired, and who now took arms to protect the safety of his ubjects, as well as to support the grandeur of his throne. Such was the rapidity of his movement, especially after being informed of the destructive ravages of the enemy in Cappadocia, that he marched from the shores of the Caspian to those of the Euxine Sea before the army of Crœsus had provided the necessaries for their advance. That prince, when apprized of the neighbourhood of the Persians, encamped on the Pterian plain; Cyrus likewise took up a position at no great distance; frequent skirmishes occurred between the light troops; and at length a general engagement was fought with equal fury and perseverance, and only terminated by the darkness of night. The loss on both sides prevented a renewal of the battle. But the numbers as well as the courage of the Persians much exceeded the expectation of Crœsus; and as they discovered no intention of harassing his retreat, he determined to fall back towards Sardis, in order to spend the winter in the amusements of his palace, and, after summoning his numerous allies to his standard, to take the field early in the spring with such increase of force as would be sufficient to overpower the Persians.

But this design was defeated by the watchful vigilance of Cyrus. That experienced leader allowed the enemy to retire without molestation, carefully informing himself of every movement they made, and of every measure they seemed determined to pursue. Patiently watching the opportunity of a just revenge, he waited until Crœsus had re-entered his capital, and disbanded the foreign mercenaries, who composed the most numerous division of his army. Cyrus then put his Persians in motion; and such was his celerity, that he brought the first intelligence of his own arrival in the plain of Sardis. Crœsus, whose firmness might well have been shaken by the imminence of this unforeseen danger, was not wanting on the present occasion to the duties which he owed to his fame and the lustre of the Lydian throne. Though his mercenaries were disbanded, his own subjects, who served him from attachment, who had been long accustomed to victory, and who were animated with a high sense of national honour, burned with a desire to check the daring insolence of the invaders. Crœsus indulged and encouraged this generous ardour. The Lydians in that age fought on horseback, armed with long spears; the strength of the Persians consisted in their infantry. The latter were so little accustomed to the use of horses, that camels were almost the only animals which they employed as beasts of burden. This circumstance suggested to a Mede, by name Harpagus, a stratagem, which, being communicated to Cyrus, was immediately adopted with the approbation of that prince. Harpagus, having observed that horses had a strong aversion to the shape and smell of camels, advised that the Persian army should be drawn up in the following order: All the camels which had been employed to carry baggage and provisions were collected into one body, and arranged in a line fronting the Lydian cavalry. The foot soldiers of the Persians were posted immediately behind this line, and placed at a due distance; and the Median horse, a few squadrons of which followed the standard of Cyrus, formed the rear of the army. As the troops on both sides approached to join battle, the Lydian cavalry, terrified at the unusual appearance of the camels, mounted with men in arms, were thrown into disorder, and the horses, turning their heads, endeavoured to escape from the field. Crœsus, who perceived the confusion, was ready to despair of his fortune; but the Lydians, abandoning their horses, prepared with uncommon bravery to attack the enemy on foot. Their courage deserved a better fate; but, unaccustomed as they were to this mode of fighting, they were received and repelled by the experienced valour of the Persian infantry, and obliged to take refuge within the fortified strength of Sardis, where they imagined themselves secure. The walls of that city bade defiance to the rude art of attack, as then practised by the most warlike nations. If the Persian army should invest it, the Lydians were provided with provisions for several years; and there was reason to expect that in a few months, nay even weeks, they would receive such assistance from Egypt, Babylonia, and Greece, to which countries they had already sent ambassadors, as would oblige the Persians to raise the siege.

The Lydian ministers despatched into Greece met with great sympathy from the Spartans. That people were particularly observant of the faith of treaties; and whilst they punished their enemies with unexampled severity, they behaved with generous compassion towards those whom they had once accepted as allies. They immediately resolved therefore to send speedy and effectual relief to Crœsus; and for this purpose they assembled their troops, made ready their vessels, and prepared every thing necessary for the expedition. The valour of the Spartans might perhaps have upheld the sinking empire of Lydia; but before their armament set sail, Crœsus was no longer a sovereign. Notwithstanding the strength of Sardis, that city had been taken by storm on the twentieth day of the siege; the walls having been scaled in a quarter which, appearing altogether inaccessible, was too carelessly guarded. This was effected by the enterprise of Hyreades, a Mede, who accidentally observed a sentinel descend part of the rock in order to recover his helmet. Hyreades was a native of the mountainous province of Mardia, and, being accustomed to clamber over the dangerous precipices of his native country, resolved to try his activity in passing the rock upon which he had discovered the Lydian. The design was more easily accomplished than he had reason to expect; emulation and success encouraged the bravest of the Persians to follow his example; these were supported by great numbers of their countrymen; the garrison of Sardis was surprised, the citadel stormed, and the rich capital of Lower Asia subjected to the vengeful rapacity of an indignant conqueror. Thus ended the ancient kingdom of Lydia, which continued subject to the Persians until they in their turn were conquered by the Macedonians.

LYDIAT, Thomas, a learned English divine, was born in 1572, and educated at Oxford. About the year 1609, he became acquainted with Dr James Usher, afterwards archbishop of Armagh, who carried him to Ireland. He studied at Dublin College for about two years, after which he returned to England; and the rectory of Alkrington becoming vacant, he was presented to it. But at length, being bound for the debts of a near relation, which he found himself unable to pay, having before spent his patrimony in printing several books, he was sent to prison, and confined at Oxford, in the King's Bench, and elsewhere, until Sir William Boswell, a generous patron of learned men, Dr Robert Pink, warden of New College, Bishop Usher, and Dr Laud, discharged the debt. In the civil wars he suffered much in his rectory of Alkrington from the parliamentary party, by whom he was four times pillaged to the value of at least L.70, and even forced for a quarter of a year together to subsist on the bounty of others. He wrote some pieces in English, and several works in Latin, on chronology, and natural history; and died in 1646.

LYDIUS Lapis, in the natural history of the ancients, the name of the stone used by way of touchstone for the trial of gold and silver, and called by some *Heraclius lapis*. Both of these names were also applied by the ancients to the loadstone; and hence has arisen no small misunderstanding of their works. Pliny has observed, that both the loadstone and touchstone were at times called *Lydius* and *Heraclius lapis*.

The true *lapis Lydius*, or touchstone, was anciently found only in the river Tmolus; but it was afterwards discovered in other places, and is now very common in many of the German rivers. The ancients give us very remarkable and circumstantial accounts of the uses they made of it; and it is plain that, by means of it, they were able to discern the alloys of gold with very great exactness. We at present use several different stones under this name, and for the same purpose. In Italy, a green marble called *verdello* is most frequently employed; and with us small pieces of *basalt*.

LYDNEY, a town of the county of Gloucester, in the hundred of Blideslow, on the western side of the Severn, 123 miles from London. It was formerly a Roman station, and more extensive than at present. The market was held on Wednesday, but has of late years disappeared. In the neighbourhood are extensive iron and coal mines. The parish, including the chapelry of Aylburton, contained a population amounting in 1801 to 1032, in 1811 to 1160, in 1821 to 1393, and in 1831 to 1534.

LYME-REGIS, a borough and market town of the county of Dorset, in the hundred of Whitchurch, 143 miles from London. It stands on the side of a steep hill, overlooking the sea, and has a small artificial harbour, called the Cobbe, secure for vessels of small tonnage. It has been much frequented of late years for the purposes of sea-bathing, and appropriate institutions for the accommodation of visitors have been established. It is an ancient borough, and previously to the passing of the reform act returned two members to parliament, but now elects only one. There is a well-supplied market on Friday. The population amounted in 1801 to 1451, in 1811 to 1925, in 1821 to 2269, and in 1831 to 2621.

LYMINGTON, a market and borough town of the county of Hants, in the parish of Boldre, in the New Forest. It stands on a creek about half a mile from the sea. It is pleasantly situated on the brow and declivity of a gentle hill, looking towards the Isle of Wight; and many of the houses are highly respectable in appearance. It has been lately frequented by visitors for the purpose of sea-bathing. It is a corporation, and returns, as before the recent law, two members to parliament; but other places in the vicinity are added to make up the proper constituency. The population amounted in 1801 to 2378, in 1811 to 2641, in 1821 to 3164, and in 1831 to 3361.

LYMPH, a fine colourless fluid, separated in the body from the mass of blood, and contained in peculiar vessels called *lymphatics*.

LYMPHÆA were artificial caves or grottoes amongst the Romans, furnished with a great many tubes, canals, and various hydraulic apparatus, through which the water gushed out unexpectedly upon the spectators whilst they were admiring the beautiful arrangement of the shell-work in the grotto.

LYMPHATI was a name given by the Romans to such as were seized with madness. It is supposed to be used for *Nymphati*, because the ancients imagined that every person who had the misfortune to see a nymph was instantly struck with frenzy. *Lymphati* may indeed signify madmen, as derived from *lympha*, water, over which element the nymphs were thought to preside; but it appears most likely that distracted people were called *lymphati*, from the circumstance of madmen being affected with the *hydrophobia*, or dread of water, after the bite of a mad dog; for this peculiarity, in cases of canine madness, was not unknown to the Romans.

LYNCEUS, in fabulous history, one of the fifty sons of Ægeus, married Hypermnestra, one of the fifty daughters of Danaus.

Lynceus, in fabulous history, one of the Argonauts who accompanied Jason in the expedition to Colchis to obtain the golden fleece. He was of great use to the Argonauts, by enabling them to avoid the sand-banks and rocks which they found in their way. The poets say that Lynceus had so piercing a sight that it could not only penetrate to the bottom of the sea, but even to the shades below. Some mythologists suppose that this fable arose from the skill of Lynceus in observing the stars, and discovering the mines of gold and silver concealed in the earth.

LYNCURIUM, a stone believed to be the same with the tourmaline. The name is derived from λυγξ, *lynx*, and ὀυϱον, *urine*.

LYNCURIUS Lapis, a stone which was supposed capable of producing mushrooms.

LYNDHURST, a township and chapelry in the parish of Minstead, in the county of Hampshire. It is situated in one of the most beautiful parts of the New Forest, nine miles from Southampton, and eighty-six from London. The forest is about forty miles in compass, containing several towns and villages, with thirty-six churches, and, though laid waste as a hunting ground by William the Conqueror, is in a great part now fertile and productive. The pleasing town of Lyndhurst may be considered as a kind of metropolis of the New Forest. It gives the title of a baron to a late lord chancellor. The inhabitants amounted in 1801 to 882, in 1811 to 1015, in 1821 to 1170, and in 1831 to 1236.

LYNN-REGIS, a sea-port, market-town, and borough of the county of Norfolk, in the hundred of Freebridge, ninety-seven miles from London. It is situated on the right bank of the river Ouse, about eight miles from the sea. The harbour is capable of receiving 300 sail of vessels. From its situation at the mouth of a long river, it is advantageously placed for exporting the productions of the soil, and for conveying to a large district the foreign commodities they require. There is a large quantity of wine imported from Portugal and Spain, and of hemp, wood, flax, and other articles from the Baltic. The market-place is very extensive and handsome; the quays for landing wine are convenient; and though some of the streets are narrow, it is on the whole a well-built town. It is governed by a mayor, high steward, recorder, and aldermen, and returns two members to parliament. There are good markets on Tuesdays and Saturdays. The principal church, St Margaret's, is one of the largest parochial churches in England. It was erected in 1160, and repaired and enlarged in 1741. There are two other churches or chapels, besides places of worship for the several descriptions of dissenters. The population amounted in 1801 to 10,096, in 1811 to 10,259, in 1821 to 12,253, and in 1831 to 13,370.

LYON King of Arms. This office is of great antiquity and respect in Scotland; and although the precise date of its institution is unknown, yet it must have been as early as the introduction of armorial figures as hereditary marks of gentility and distinction into this country, which was in the twelfth century. The regalia of this officer are, a crown of gold, with a crimson velvet cap, a gold tassel, and an ermine lining; a velvet robe reaching to his feet, with the arms of the kingdom embroidered thereon, before and behind, in the proper tinctures; a triple row of gold chains round his neck, with an oval gold medal pendant thereto, on one side of which is the royal bearing, and on the other St Andrew with his cross enamelled in proper colours, and a baton of gold enamelled green, powdered with the badges of the kingdom. The Lord Lyon's rank is superior to that of any other king of arms, as he holds his office immediately from the sovereign by commission under the great seal; whereas the kings at arms in England are deputies to the Earl Marshal, and act under his authority. Formerly Scotland was divided into two provinces, the one on the north, and the other on the south side of the Forth; and these provinces were under the management of two deputies appointed by the Lord Lyon, to superintend the execution of all the business of his office. Before the revolution, the Lord Lyon, upon his admission to office, was solemnly crowned by the sovereign or his commissioner, in presence of the nobility, the officers of state, and other great men, after a suitable sermon preached in the royal chapel; and his crown was of the same form with the imperial crown of the kingdom. On solemn occasions he wears the regalia above described; at all other times he wears the oval gold medal or badge on his breast, suspended by a broad green ribbon. He has the absolute disposal of all the offices in his own court, and of the places of heralds and pursuivants. The messengers at arms throughout Scotland are also created by him, and are amenable to his jurisdiction; and the powers vested in him by his commission are the same with those of the sovereign in all matters relative to the marks of gentility. See Heraldry.

LYONET, Peter, an ingenious naturalist, and member of several learned societies, was born at Maestricht, and descended from a very ancient and respectable family of Lorraine. He had scarcely attained his seventh year when he displayed an uncommon strength and agility in all bodily exercises; but he was not less diligent in the improvement of his mind. Being placed at the Latin school, he learned chronology, and exercised himself in Latin, Greek, and French poetry, as also in Hebrew, logic, and the Cartesian physics. He was particularly fond of the study of languages, of which he understood no less than nine, living and dead. Having entered the university of Leyden, he studied the Newtonian philosophy, geometry, and algebra; but his father, who was a clergyman, desiring that he should apply himself to divinity, he reluctantly abandoned the former studies, his passion for which was not to be easily overcome. At the same time he applied himself to anatomy, and also to music and drawing. He afterwards began to practise sculpture, and executed several pieces in wood, some of which are preserved, and have been greatly admired by the artists. He then betook himself to drawing portraits of his friends from life, in which, after three or four months' practice, he became a great proficient. Having attained the degree of candidate in divinity, he resolved to study law, to which he applied himself with so much zeal, that he was promoted at the end of the first year. Having arrived at the Hague, he undertook the study of deciphering, and became secretary of ciphers, translator of the Latin and French languages, and patent-master to their High Mightinesses. Meanwhile, having taken a strong liking to the study of insects, he undertook to give an historical description of such as are found about the Hague, and with that view collected materials for several volumes; and having invented a method of drawing adapted thereto, he enriched this work with a great number of plates, universally admired by all connoisseurs. In the year 1724 was printed, at the Hague, a French translation of a German work entitled the Theology of Insects, by Mr Lesser. Love of truth induced Mr Lyonet to defer the publication of his description above mentioned, and to make some observations on that work, to which he added two beautiful plates, engraved from his designs. This performance caused his merit to be universally known. The celebrated M. de Reaumur had this translation reprinted at Paris, not so much on account of the work itself, as of Mr Lyonet's observations; and bestowed upon it, as did also many other authors, the highest encomiums. He afterwards executed drawings of the fresh-water polypus for Mr Trembley's beautiful work, 1744. The ingenious Wandelaar had engraved the first five plates, when Mr Lyonet, who had never witnessed this operation, concerned at the difficulties he experienced in getting the remaining eight finished in the superior style he required, resolved to perform the task himself. He accordingly took a lesson of one hour from Mr Wandelaar, engraved three or four small plates, and immediately began upon the work himself, which he executed in such a manner as attracted the highest praise, both from Mr Trembley and from many other artists, particularly the celebrated Van Gool, who declared that the performance astonished not only the amateurs, but also the most experienced artists. In 1748 he was admitted a member of the Royal Society of London. In 1749 he began, by mere chance, his collection of horns and shells, which, according to the universal testimony of all travellers and amateurs who visited it, became the most beautiful, and certainly one of the most valuable, in Europe. In 1753 he was chosen a member of the Dutch Society of Sciences at Haerlem, then recently established; and in 1757, after the celebrated M. le Cat, professor of anatomy and surgery, had seen Mr Lyonet's *Traité Anatomique de la Chénille qui ronge le Bois de Saule*, with the drawings belonging to it (a work which was afterwards published), he was elected member of the Royal Academy of Sciences of Rome, of which M. le Cat was perpetual secretary. After the publication of this treatise, he became, in 1760, member of the Royal Academy of Sciences of Berlin; in 1761, of the Imperial Academy of Naturalists; and, in 1762, of the Imperial Academy of Sciences at St Petersburg. In order to enable such as might be desirous of following him in his intricate and astonishing discoveries respecting the structure of this animal, Mr Lyonet published, in the Transactions of the Dutch Society of Sciences at Haerlem, a description and plate (as he afterwards did in French at the beginning of his *Traité Anatomique*) of the instrument and tools he had invented for the purpose of dissection, and likewise of the method he had used to ascertain the degree of strength of his magnifying glasses. But notwithstanding all his labours, which were considerably increased by the extensive correspondence which he had for many years carried on with several learned persons, he still found means to set apart a large proportion of his time for the immediate service of his country; but he was not fortunate enough to get any other recompense for his exertions than sorrow and disappointment. During the last fifteen or twenty years of his life, Mr Lyonet added to the valuable treasure he had already collected of natural curiosities, a superb cabinet of paintings, consisting of more than 560 performances, amongst which are many of the most eminent works of the first Dutch masters. His object in doing so was to procure himself some amusement during the latter part of his life, when old age and infirmities had weakened his powers, and set bounds to his activity. He had always indeed accustomed himself to employment, insomuch that he wrote some pieces of Dutch poetry; and this disposition remained with him until within a fortnight of his death, when he was attacked with an inflammation in the chest, which, though apparently cured, proved in the end the cause of his death. He died at the Hague in January 1789, aged eighty-three years, leaving behind him a most estimable character.

LYONS, or Lyon, an arrondissement of the department of the Rhone, in France, 531 square miles in extent. It comprehends sixteen cantons, which are divided into 128 communes, and contains 225,670 inhabitants. The capital is the city of the same name, built by the Romans before the Christian era, and at present, next to Paris, the most important city in the French dominions. It is on a peninsula formed by the junction of the rivers Saone and Rhone; the quays on whose banks are the most striking parts of the city, which, though built since the revolutionary destruction of it, has scarcely any erections worthy of much admiration; but some of the numerous bridges over the two rivers are striking objects. The most remarkable buildings are the Saracenic cathedral, the hotel de ville, and the hospital called hotel de Dieu. There is an establishment for education, consisting of a primary and secondary school of great repute, with the finest provincial library in France, consisting of about 120,000 volumes, with which are connected a museum, an observatory, a botanical garden, and a veterinary institution. Abundance of Roman antiquities are to be seen in the city and its vicinity. The population is at present about 140,000 persons, but it includes the commune. The chief occupation is the manufacturing of silk goods, velvets, satins, and all other kinds of the same elegant fabrication. There are, besides, as appears by the statement below, manufacturers of cotton, woollen, and leather goods, as well as of gold lace, jewellery, paper, and a variety of chemical preparations, and of perfumery. Lyons is remarkable as the birth-place of the Emperors Claudius and Caracalla, and of the poet Sidonius Apollinaris; and, in modern times, of the sculptor Coisevor, of the naturalist Jussieu, and of the antiquarian Spon. It is in long. 4. 44. E., and lat. 45. 45. N.

A Statement of the Operative Population of the City of Lyons, distinguishing the several Trades and Manufactures in which the same are engaged, and the number actually employed in each, exclusively of their Families when the same are not employed in any Trade or Manufacture.

Description.	Numbers Employed.				
	Masters.	Journeymen.	Women.	Children.	Total.
Silk manufacturers	8,000	8,000	7,000	12,000	35,000
Boot and shoe makers	400	2,000	4,000	2,000	8,400
Printers	120	1,400	1,800	700	4,020
Tailors	400	1,000	3,000	1,600	6,000
Hatters	300	800	2,000	1,500	4,600
Metal founders	50	600	400	600	1,650
Makers of tule	100	300	500	400	1,300
Jewellers	150	200	250	500	1,100
Joiners	300	3,000	600	1,500	5,400
Masons	150	1,200	200	800	2,350
Carpenters	100	1,200	200	600	2,100
Porters	...	800	500	700	2,000
Bakers	200	300	200	400	1,100
Tin-smiths	150	400	120	250	920
Curriers	50	300	70	150	570
Carry forward	10,470	21,500	20,840	23,700	76,510

Description.	Numbers Employed.				
	Masters.	Journeymen.	Women.	Children.	Total.
Brought forward......	10,470	21,500	20,840	23,700	76,510
Hairdressers....................	300	400	150	200	1,050
Dyers..........................	70	400	150	250	870
Cartwrights....................	100	300	100	200	700
Plasterers......................	80	300	100	300	780
Butchers.........................	300	400	300	500	1,500
Coopers.........................	100	200	100	200	600
Smiths...........................	100	250	100	250	750
Saddlers.........................	80	200	100	200	580
Stone-masons....................	20	150	30	50	250
Marble-workers................	40	100	40	100	280
Scale-makers.....................	50	100	60	120	330
Turners...........................	80	100	80	150	410
Locksmiths.......................	150	400	200	400	1,150
Unenumerated..................	3,000	5,000	4,500	8,000	20,500
Total,........	14,940	29,800	26,850	34,620	106,260

The quantity of silk manufactured during the year 1835, was 743,125 kilogrammes. The returns show an excess of 24,422 kilogrammes over the quantity of 1833, and 141,516 kilogrammes over that of 1824, which latter was the most prosperous year during the restoration. The kilogramme is equal to 2 lbs. 8 oz. 3 dwts. 2 grs. troy weight.

LYRA, in *Astronomy,* a constellation in the northern hemisphere. The number of its stars, in Ptolemy's catalogue, is ten; in Tycho's eleven; in Hevelius's seventeen; and in the Britannic catalogue twenty-one.

LYRE, a musical instrument of the stringed kind, much used by the ancients. Concerning the number of strings with which this instrument was furnished, there has been great controversy. Some assert that it had only three; that the sounds of the two remote were acute, and that of the intermediate one a mean between these two extremes; and that Mercury, the inventor, compared these three chords to as many seasons of the year, which were all that the Greeks reckoned, namely, summer, winter, and spring, assigning the acute to the first, the grave to the second, and the mean to the third. Others assert that the lyre had four strings; that the interval between the first and the fourth was an octave; that the second was a fourth from the first, and the fourth the same distance from the third, and that from the second to the third was a tone. Another class of writers contend that the lyre of Mercury had seven strings. Nicomachus, a follower of Pythagoras, and the chief of them, gives the following account of the matter: "The lyre made of the shell was invented by Mercury; and the knowledge of it, as it was constructed by him of seven strings, was transmitted to Orpheus; Orpheus taught the use of it to Thamyris and Linus; the latter of whom taught it to Hercules, who communicated it to Amphion the Theban, who built the seven gates of Thebes to the seven strings of the lyre." The same author proceeds to relate, "that Orpheus was afterwards killed by the Thracian women; that they are reported to have cast his lyre into the sea, which was afterwards thrown up at Antissa, a city of Lesbos; that certain fishers finding it, brought it to Terpander, who carried it into Egypt, exquisitely improved, and, showing it to the Egyptian priests, assumed to himself the honour of its invention." This difference amongst authors seems to have arisen from their confounding together the Egyptian Thoth or Hermes, and the Greek Mercury. The invention of the primitive lyre with three strings was due to Hermes the Egyptian. The lyre attributed to the Greek Mercury is described by almost all the poets as an instrument of seven strings. Vincenzio Galilei has collected the various opinions of the Greek writers who have mentioned the invention of the *chelys* or *testudo;* and Mr Spence did the same thing in a very circumstantial but ludicrous manner. "Horace talks of Mercury as a wonderful musician, and represents him with a lyre. There is a ridiculous old legend relating to this invention, which informs us, that Mercury, after stealing some bulls from Apollo, retired to a secret grotto which he used to frequent, at the foot of a mountain in Arcadia. Just as he was going in, he found a tortoise feeding at the entrance of his cave; he killed the poor creature, and perhaps ate the flesh of it. As he was diverting himself with the shell, he was mightily pleased with the noise it gave from its concave figure. He had possibly been cunning enough to find out, that a thong pulled strait and fastened at each end, when struck with the finger, made a sort of musical sound. However that was, he went immediately to work, and cut several thongs out of the hides he had lately stolen, and fastened them as tight as he could to the shell of this tortoise; and, in playing with them, made a new kind of music with them, to divert himself in his retreat." This, considered only as an account of the first invention of the lyre, is not altogether unnatural. The most ancient representations of this instrument agree very well with the account of its invention. The lyre in particular on the old celestial globes was represented as made of one entire shell of a tortoise; and that of Amphion in the celebrated group of the Dirce or Toro, in the Farnese palace at Rome, which is of Greek sculpture, and very high antiquity, is figured in the same manner. There have, however, been many other claimants to the invention of the seven-stringed lyre. For though Mercury invented this instrument in the manner already related, it is said he afterwards gave it to Apollo, who was the first that played upon it with method, and made it the constant companion of poetry. According to Homer's account of this transaction, in his hymn to Mercury, it was given by that god to Apollo, as a peace-offering and indemnification for the oxen which Mercury had stolen from him. Diodorus informs us, that Apollo soon repenting of the cruelty with which he had treated Marsyas in consequence of their musical contest, broke the strings of the lyre, and by that means put a stop for a time to any further progress in the practice of the new instrument. "The Muses," adds he, "afterwards added to this instrument the string called *mese;* Linus, that of *lichanos;* and Orpheus and Thamyris, those strings which are named *hypate* and *parhypate.* Again, many ancient and cre-

Lyric Poetry || Lysias.

dible authors inform us, that, before the time of Terpander, the Grecian lyre had only four strings; and, if we may believe Suidas, it remained in this state 856 years, from the time of Amphion, until Terpander added to it three new strings, which extended the musical scale to a heptachord, or seventh, and supplied the player with two conjoint tetrachords. It was about 150 years after this period, that Pythagoras is said to have added an eighth string to the lyre, in order to complete the octave, which consisted of two disjoint tetrachords. But Boetius gives a different history of the scale, and informs us, that the system did not long remain in such narrow limits as a tetrachord. Choræbus, the son of Athis, or Atys, king of Lydia, added a fifth string; Hyagnis, a sixth; Terpander, a seventh; and at length Lychaon of Samos, an eighth. But all these accounts are irreconcileable with Homer's hymn to Mercury, where the *chelys* or *testudo*, the invention of which he ascribes to that god, is said to have had seven strings. There are many claimants amongst the musicians of ancient Greece to the strings afterwards added to these, by which the scale, in the time of Aristoxenus, was extended to two octaves. Athenæus more than once speaks of the nine-stringed instrument; and Ion of Chios, a tragic and lyric poet and a philosopher, who first recited his pieces in the eighty-second Olympiad, 452 B. C. mentions, in some verses quoted by Euclid, the ten-stringed lyre; a proof that the third conjoint tetrachord was added to the scale in his time, which was about fifty years after Pythagoras is supposed to have constructed the octachord. The different claimants amongst the Greeks to the same musical discoveries, only prove that music was cultivated in different countries, and that the inhabitants of each country invented and improved their own instruments; some of which happening to resemble those of other parts of Greece, rendered it difficult for historians to avoid attributing the same invention to different persons. Thus the single flute was ascribed to Minerva and to Marsyas; the syrinx or fistula, to Pan and to Cybele; and the lyre or cithara, to Mercury, Apollo, Amphion, Linus, and Orpheus. Indeed, the mere addition of a string or two to an instrument without a neck was so obvious and easy, that it is scarcely possible not to conceive that many people may have done it at the same time.

LYRIC POETRY was such as the ancients sung to the lyre or harp. It was originally employed in celebrating the praises of gods and heroes, and its characteristic was sweetness. The author or inventor of it is, however, unknown. It was much cultivated by the Greeks; and Horace was the first who attempted it in the Latin language. Anacreon, Alcæus, Stesichorus, Sappho, and Horace, were the most celebrated lyric poets of antiquity.

LYRODI, amongst the ancients, a kind of musicians who played on the lyre, and at the same time sung. This appellation was also given to such as made it their employment to sing lyric poems composed by others.

LYSANDRIA, a Samian festival, which was celebrated with games and sacrifices in honour of the Lacedæmonian general Lysander. It was anciently called *Herea;* but this name the Samians abolished by a public decree.

LYSIARCH, an ancient magistrate, who superintended the sacred games, and presided in matters of religion, in the province of Lycia. He was created in a council consisting of deputies from all the provincial cities, twenty-three in number. The lysiarchs were heads both of the council and the pontiffs of the province.

LYSIAS, one of the most celebrated of the Greek orators, was born at Athens 458 B. C., and died, at the age of eighty, B. C. 378. He was the contemporary of some of the greatest men that Athens ever produced, of Thucydides and Xenophon, of Euripides and Sophocles. He was the son of Cephalus, a Syracusan, and is himself sometimes said to have been a native of this city; but he was born at Athens, whither his father was induced to emigrate by the advice of his friend Pericles. Cephalus was distinguished both for his great riches and for his virtues. It was at his house that Plato placed the scene of the most celebrated of his works, his Dialogues on the Republic. Cephalus no doubt procured the best masters to forward the education of his son; but Lysias left Athens at a very early age (B. C. 443), and proceeded to Thurium in the south of Italy, to which place the Athenians were sending a colony. He was accompanied by the two celebrated historians Herodotus and Thucydides, and remained there for many years, during which time he is said to have studied the art of eloquence under two Syracusans, Tisias and Nisias. After the unsuccessful expedition of the Athenians to Sicily (B. C. 413), it would appear that Thurium, with their other dependencies in Magna Græcia, refused to submit any longer to Athenian supremacy. All those who remained well affected towards the parent state were obliged to fly, and Lysias on that occasion (B. C. 411) returned with his brother Polemarchus to Athens. Here he employed himself in commercial pursuits, and we are told that the two brothers employed one hundred and twenty slaves in the manufacture of shields. We do not hear that he took any active part in the stormy politics of Athens, now approaching the conclusion of her war with Sparta. Athens fell into the hands of Lysander, and thirty tyrants were appointed to administer the affairs of the city. The patriotism and riches of Polemarchus and of his brother Lysias marked them out as fit objects for persecution to the tyrants. Polemarchus was put to death, and Lysias with great difficulty saved his life by flying to Megara (B. C. 404). Here he engaged in the conspiracy to restore the independence of his country, and is said to have furnished three hundred men at his own expense to assist Thrasybulus. The tyrants were expelled, and Lysias returned to Athens (B. C. 403), where he commenced his new career as an orator. It does not appear that he was much employed in the assemblies of the people, but that he confined himself principally to writing *accusations* or *defences*, at the desire of such persons as had occasion to impeach the conduct of others, or to defend their own. As a reward for his services, Thrasybulus proposed to the people that he should be admitted to the freedom of the state; but Archinus procured its rejection, because the proposal had not been made first to the senate, as the law required. Plutarch states that there were extant in his time no less than 475 orations ascribed to Lysias, of which only 235 were genuine, according to Dionysius. We are likewise told that he composed institutions of oratory, epistles, and panegyrics; but of all these writings only thirty-four orations have come down to us, some of which are in an imperfect state. The pleadings of Lysias contain a curious detail of the domestic manners and internal economy of the Greeks. Dionysius of Halicarnassus has written a critique on the works and style of Lysias; and, according to him, the orator was particularly distinguished for simplicity and precision, as well as for the fidelity with which he depicted the manners of the age. Quintilian compares him to a clear and pure rivulet rather than to a majestic river, whilst Cicero considers him as the model of a perfect orator. The earliest edition of the orations of Lysias is that of Aldus, 1513; but the best is that of Taylor, Gr. et Lat. London, 1739, and of Reiske, Leipzig, 1772. The latest edition is by Foertoch (Lips. 1829); and he has also published separately, *Observationes criticæ in Lysiæ Orationes*, Lips. 1829. See also Franzius, *Dissertatio inaug. de Lysia oratore Attico-Græce scripta*, Norimb. 1828. There is an English translation of the Orations by Gillies, London, 1778.

LYSIMACHUS, one of the generals of Alexander, was son of Agathocles, one of the king's body guard, but of noble descent. He appears to have been one of the noblest characters that the age of Alexander, so fertile in great men, produced. He was the pupil of the philosopher Callisthenes, who attended Alexander in his expedition; and when the king ordered Callisthenes to be put to death for some slight offence, by the most cruel tortures, Lysimachus enabled his friend to escape by furnishing him with poison. (See CALLISTHENES.) It might have been expected that Alexander would have admired such conduct, but it was far otherwise. He ordered Lysimachus to be exposed to the fury of a lion, and that he should suffer a death somewhat resembling that which had been intended for his friend. The bravery of Lysimachus saved him: wrapping his cloak round his arm, he pushed it into the throat of the lion, and laid it dead at his feet. Alexander forgave him, and attached him more particularly to his own person. This story, which is told by Justin (xv. 3), Pliny (viii. 16), and Seneca (*De Ira*, 3, 17, et *De Clem.* 1, 25), is called fabulous by Curtius (viii. 1, 22), and is said to have originated from the circumstance of Lysimachus having been attacked by a lion in the forests of Syria, and having killed it without assistance. From this moment Alexander treated Lysimachus as his friend, and was so fond of him, that having accidentally wounded him on the forehead as he was dismounting, he took off his diadem and bound up his head with his own hands, presaging, as Justin remarks, the royal rank to which he would afterwards attain. History is then silent respecting Lysimachus till the death of Alexander (B. C. 323), when we find him receiving, as his share of the kingdom, Thrace, and the countries placed along the coast of the Euxine (Justin, xiii. 4). But Seuthes occupied Thrace with a powerful army, and it was found necessary to conquer him before he could take possession of the kingdom. In this he was successful, and also in repressing a rebellion which had broken out at Callatia, on the coast of the Black Sea (Diodor. xviii. 14; xix. 73). No sooner did he feel secure of his dominions, however, than he began to attack the Odrysæ, Getæ, and other nations around; but he was defeated and taken prisoner, according to some historians, though, according to others, it was his son. Be this as it may, his daughter was given in marriage to the king of the country for releasing the captive (Pausan. i. ix.). The ambition of Antigonus began to alarm the other successors of Alexander, and a league was entered into by Ptolemy, Cassander, and Lysimachus, to reduce his power within due bounds. The war was carried on with various success for several years. Lysimachus proceeded to Asia (B. C. 302) to attack Antigonus, who was then at Antigonea in Syria, and in his passage subdued Phrygia, Lydia, and other districts, taking possession of many strong fortresses, where Antigonus had collected much treasure. He was joined by Seleucus, who arrived from Babylon with a considerable body of troops, and a decisive battle was fought (B. C. 301) at Ipsus, where Antigonus was defeated and killed (Justin, xv. 4). In addition to Thrace, Lysimachus obtained Bithynia, and some countries along the Hellespont. Yet Demetrius, son of Antigonus, did not lose courage, but made constant attempts to recover his dominions. A league was formed against him by Lysimachus and Pyrrhus king of Epirus, and he was driven from the greater part of Macedonia; but the two allies afterwards disagreed, and Pyrrhus having been defeated, Lysimachus assumed the title of king of Macedonia, B. C. 286. In his latter years he put to death his son Agathocles, at the suggestion of his second wife, who was afraid that she herself and her children would fall into the hands of Agathocles on the death of Lysimachus. Seleucus, taking advantage of the odium which this act brought upon him, attacked Lysimachus, and having given him battle, Lysimachus was killed, B. C. 281 (Pausan. i. x.; Justin, xvii. 1, 2).

LYSIPPUS, a celebrated Greek statuary, of the city of Sicyon, in the Peloponnesus, flourished about 324 B. C. He was at first a worker in brass, but afterwards devoted himself to statuary, studying nature, by the advice of Eupompus, rather than following the manner of any master. He excelled all those who had preceded him, in the nicety of individual parts, and more particularly in the beauty of the hair. He lessened the size of the head, which had been exaggerated by the ancient sculptors, and made the body more slim, so as to increase the appearance of the height. He used to say, that former sculptors represented men as they should be, whilst he merely made them as they seemed to be. His reputation was such that his name was included in the famous edict published by Alexander, when he conferred on Apelles the sole right of painting his form, on Lysippus that of executing it in bronze, and on Pyrgoteles that of engraving it on precious stones. He is said (Plin. xxxiv. 7) to have produced fifteen hundred works of art, any one of which was sufficient to stamp him as a man of talent. Of these we can only mention a few of the most celebrated. There was one at Rome, the removal of which from the baths of Agrippa to the palace of the emperor, by order of Tiberius, had nearly caused a sedition. The populace clamoured for its being replaced, and Tiberius did not deem it prudent to deny their request. It was a statue called Apoxyomenos, representing, as its name implies, a man scraping himself in the bath with a strigilis, an instrument to clean the body of the particles of sweat. He executed many statues of Alexander, representing him at different periods of his life; and he so managed, that a slight bend of the head, for which Alexander was remarkable, became rather a beauty than a deformity. One of these statues was so much admired by Nero, that he caused it to be covered with gold, to the great grief of all true lovers of the art of sculpture. He executed a very fine bronze statue of Cupid with a bow, for the inhabitants of Thespis; also equestrian statues of twenty-five Macedonians who fell at the passage of the Granicus, and which Metellus caused to be transported to Rome. It has been supposed, though without any clear proof, that the celebrated horses of Venice formed part of this group. There is a statue of Hercules in the Palazzo Pitti at Florence, which bears his name, and has in every respect a strong resemblance to the Farnese Hercules, excepting the position of the legs (*Mus. Pio-Clem.* iii. p. 66). This likewise has made it be supposed that the statue of the Palazzo Pitti is a copy of the Hercules of Lysippus, and that the Farnese is an imitation, on which Glycon thought he might engrave his name, on account of the change he had made in its position. Lysippus had as pupils his own sons, Dahippus, Bedas, and Euthycrates (Plin. xxxiv. 8. See Müller, *Handbuch der Archæologie der Kunst*, Breslau, 1830).

LYTTELTON, EDWARD, Lord Lyttelton, keeper of the great seal in the reign of Charles I. was eminent for his probity and moderation at the commencement of that monarch's disputes with his subjects. Without forfeiting his fidelity to the king, he preserved the esteem of the parliament until the year 1644, when he was made colonel of a regiment in the king's army at York. He died in 1645. Besides several of his speeches, which have been printed, he wrote reports in the Common Pleas and Exchequer, printed at London in 1683, in folio; several arguments and discourses; and various other things.

LYTTELTON, *George Lord*, eldest son of Sir Thomas Lyttelton, descended from the great Judge Lyttelton, was born in 1700, at seven months. The midwife, supposing him to be dead, threw him carelessly into the cradle, where, had not some signs of life been noticed by one of the attendants, he might never have recovered. He received the elements of his education at Eton school, where he showed an early inclination to poetry. His pastorals and some other light pieces were originally written in that seminary of learning. He was removed from thence to the university of Oxford, where he pursued his classical studies with uncommon avidity, and sketched the plan of his *Persian Letters;* a work which afterwards procured him great reputation, not only from the elegance of the language in which the letters were composed, but from the excellent observations they contained on the manners of mankind.

In the year 1728, he set out on the tour of Europe; and, upon his arrival at Paris, accidentally became acquainted with the Honourable Mr Poyntz, then our minister at the court of Versailles, who was so much struck with the extraordinary capacity of the young traveller, that he invited him to his house, and employed him in many political negociations, which he executed with great judgment and fidelity.

Mr Lyttelton's excellent conduct whilst on his travels was a lesson of instruction to the rest of his countrymen. Instead of lounging away his hours at the coffee-houses frequented by the English, and adopting the fashionable follies and vices of France and Italy, his time was passed alternately in his library and in the society of men of rank and literature. In this early part of his life, he wrote a poetical epistle to Dr Ayscough, and another to Mr Pope, both evincing singular taste and correctness.

After continuing a considerable time at Paris with Mr Poyntz, who, to use his own words, behaved like a second father to him, he proceeded to Lyons and Geneva; and thence went to Turin, where he was honoured with flattering marks of attention by his Sardinian majesty. He then visited Milan, Venice, and Genoa, and finally established himself at Rome, where he applied himself closely to the study of the fine arts, and, even in that celebrated metropolis, was allowed to be a perfect judge of painting, sculpture, and architecture.

During his continuance abroad, he constantly corresponded with his father, Sir Thomas Lyttelton. Several of his letters yet remain, and place his filial affection in a very distinguished light. He soon afterwards returned to his native country, and being elected representative for the burgh of Ockhampton in Devonshire, he conducted himself so much to the satisfaction of his constituents, that they several times re-elected him for the same place, without putting him to the least expense.

About this period, he received great marks of friendship from Frederick prince of Wales, and was, in the year 1737, appointed principal secretary to his royal highness, and continued in the strictest intimacy with him till the time of his death. In the year 1742, he married Lucy, the daughter of Mr Hugh Fortescue of Filleigh, in the county of Devon; a lady whose exemplary conduct, and uniform practice of religion and virtue, established his conjugal happiness upon the most solid basis.

In 1744, he was appointed one of the lords commissioners of the Treasury; and, during his continuance in that station, constantly exerted his influence in rewarding merit and ability. He was the friend and patron of Fielding, Thomson, Mallet, Young, Hammond, West, Pope, and Voltaire. On the death of Thomson, who left his affairs in a very embarrassed condition, Mr Lyttelton took that poet's sister under his protection. He revised the tragedy of Coriolanus, to which that writer had not put the last hand; and brought it out at the theatre-royal, Covent Garden, with a prologue of his own composition, in which he so affectingly lamented the loss of that delightful bard, that not only Mr Quin, who spoke the lines, but almost the whole audience, spontaneously burst into tears.

In the beginning of the year 1746, his felicity was interrupted by the loss of his wife, who died in the twenty-ninth year of her age, leaving him a son and daughter. He wrote a monody on her death, which will be remembered whilst conjugal affection and a taste for poetry exist in this country.

His masterly observations on the conversion and apostleship of St Paul were written at the desire of Mr Gilbert West, in consequence of Mr Lyttelton's asserting, that besides all the proofs of the Christian religion which might be drawn from the prophecies of the Old Testament, from the necessary connection it has with the whole system of the Jewish religion, from the miracles of Christ, and from the evidence given of his resurrection by all the other apostles, he thought the conversion of St Paul alone, duly considered, was of itself a demonstration sufficient to prove that Christianity was a divine revelation. Mr West was struck with the thought, and assured his friend, that so compendious a proof would be of great use to convince those unbelievers who would not attend to a longer series of arguments; and time has shown that he was not mistaken in his conjecture, as the tract is esteemed one of the best defences of Christianity which has hitherto been published.

In 1754, he resigned his office of lord of the Treasury, and was made cofferer to his majesty's household, and sworn a member of the privy council; previously to which, he married a second time, Elizabeth, daughter of Field-marshal Sir Robert Rich, a lady whose indiscreet conduct gave him great uneasiness, and from whom he was separated, by mutual consent, a few years after his marriage.

After being appointed chancellor, and under-treasurer of the court of exchequer, he was, by letters-patent dated the 19th of November 1757 (31 Geo. II.), created a peer of Great Britain, by the style and title of Lord Lyttelton, baron of Frankley, in the county of Worcester. His speeches on the Scotch and mutiny bills in the year 1747, on the Jewish bill in 1753, and on the privilege of parliament in 1763, showed sound judgment, powerful eloquence, and inflexible integrity. During the last ten years he lived chiefly in retirement, in the continual exercise of all the virtues which ennoble private life. His last work was *Dialogues of the Dead*, in which the morality of Fénélon and the spirit of Fontenelle are happily united.

In the middle of July 1773, he was suddenly seized with an inflammation of the bowels, which terminated in his death, at his seat near Hagley, on the 22d of that month. A complete collection of his works was published after his decease, by his nephew, Mr George Ayscough.

M.

Macaire || Macao.

M, A liquid consonant, and the twelfth letter in the alphabet. It has one unvaried sound, and is pronounced by striking the upper lip against the lower. In this the pronunciation of the letter *m* agrees with that of *b*, the only difference between the two consisting in a little motion made in the nose in pronouncing *m*, and not in *b;* and hence it happens that those who have taken cold, ordinarily pronounce *m* for *b*, the nose in that case being disabled from making the necessary motion. All consonants are formed with the aid of vowels; but in *m* the vowel precedes (*em*), in *b* it follows (*be*), and *m* is never mute. Quintilian observes, that the *m* sometimes ends Latin words, but never Greek ones; the Greeks in that case always changing it into *n*, for the sake of the euphony. M is also a numeral letter, and amongst the ancients it was used for a thousand; according to the verse,

M caput est numeri, quem scimus mille teneri.

When a dash is added on the top of it, as $\overline{\text{M}}$, it signifies a thousand times a thousand, or a million. M, as an abbreviation, stands for Manlius, Marcus, Martius, and Mucius; M. A. signifies *magister artium*, or master of arts; MS, manuscript, and MSS, manuscripts. M, in astronomical tables, and other things of that kind, is used for *meridional* or southern, and sometimes for *meridies* or mid-day. M, in medicinal prescription, is frequently used to signify a maniple or handful; and it is sometimes also put at the end of a recipe, for *misce*, mingle, or for *mixtura*, a mixture; thus, *m. f. julapium*, signifies mix and make a julep. M, in *law*, is the brand or stigma of a person convicted of manslaughter, and admitted to the benefit of his clergy.

MAAT, John. See Blankof.

MABILLON, John, a learned writer of France in the seventeenth century, was born at Perremonte, on the frontiers of Champagne, in the year 1632. He was educated in the university of Rheims, and afterwards entered into the abbey of the Benedictines of St Rémy. In the year 1663 he was appointed keeper of the treasures and monuments of France at St Denis; but having unfortunately broken a looking-glass, which was alleged to have belonged to Virgil, he desired leave of his superiors to quit an employment which frequently obliged him to say things he did not believe. Next year he went to Paris, and proved very serviceable to Father d'Acheri, who was desirous of having some young monk who could assist him in compiling his *Spicilegium*. This made Mabillon known. Soon afterwards the congregation of Saint-Maur having formed a design of publishing new editions of the Fathers, revised from the manuscripts in the libraries of the Benedictines, Mabillon was charged with the edition of St Bernard, which he prepared with extraordinary diligence. After this he published many other works evincing great capacity and industry. In 1682, he was employed by M. Colbert in examining some ancient titles relating to the royal family. In the year following the same minister sent him into Germany, to search the archives and libraries of the ancient abbeys, for all that seemed calculated to illustrate the history of the church in general, and that of France in particular. Mabillon published an account of this journey. In the year 1685 he undertook another journey into Italy, by order of the king of France, and returned the year following with a very noble collection. He placed in the king's library above three thousand volumes of rare books, printed and in manuscript, and composed two volumes respecting the pieces which he had discovered in that country. He was highly esteemed for his virtues as well as his learning.

MACAIRE, a town of France, in the department of the Gironde and arrondissement of Réolle, situated on the right bank of the Garonne, where the tide ceases to operate on that stream. It contains 1530 inhabitants.

MACAO, an island and town of China, belonging to the Portuguese, and the only European settlement within the limits of that empire. It was in consequence of the aid afforded by the Portuguese to the Chinese against the pirates who infested their coasts, that the privilege of a settlement was conceded to them. At first the Chinese refused to trade with the Portuguese; but being forced to have recourse to their aid, and having by their means compelled the pirates to raise the siege of Canton, and pursued them to Macao, which they took, most of the marauders were put to death. This service being reported to the emperor, he published an edict, by which the Portuguese were to have possession of Macao, with the power of forming a settlement, which they gladly accepted. They accordingly made choice of a peninsula, where they built a town, and fortified it after the European manner; but the Chinese have effectually provided for their own security, by not allowing them any provisions except what they receive through themselves. The peninsula on which the town is built is connected with the mainland by a neck of land not more than 100 yards in breadth. The territory attached to it is about three miles in length, and half a mile in breadth. The isthmus connecting it with the rest of the island is crossed by a wall projecting on both sides into the sea, and there the Chinese keep a gate and guardhouse. Beyond this wall the Portuguese are seldom permitted to pass, so that their communications with the continent are entirely in the power of the Chinese. Still the possession of the place was of great service to the Portuguese, who carried on a lucrative commerce with Japan, by which Macao became one of the richest places in their possessions. But since their expulsion from Japan, and the other European nations shared in the Canton trade, the place no longer enjoys its former prosperity.

The city of Macao is of considerable extent, the houses being built of stone, and constructed on the European plan, but without any attempt at exterior elegance, and the streets narrow and irregular. The public buildings consist of churches, convents, and the senate-house; the latter terminates the only spacious and level street of the town. The governor's house is situated on the beach, and near it is the English factory, a plain commodious building. The harbour has not a sufficient depth for vessels of great burden; and large ships generally anchor about six or seven miles off the town, bearing west-north-west. It is defended by several forts mounted with heavy cannon, and garrisoned by Portuguese troops. There is a Portuguese custom-house and quay on the south side of the town, where all ships, as they come into the bay, are obliged to send their boats. The Chinese treat the Portuguese with great *hauteur*, exacting duties sometimes in the port, and punishing individuals under the Portuguese regime; and the moment any resistance is made, the supply of provisions is stopped until harmony be restored. All sorts of provisions, vegetables, and fruits are found at Macao in great abundance. Long. 113. 32. E. Lat. 22. 10. N.

MACARCA, a market-town of the Austrian province of Dalmatia. It is a sea-port on the Adriatic, with a small but good harbour, which is protected from the winds by the islands Lessina and Brassa, opposite to it. The inhabitants are 1620, chiefly employed in the fisheries.

MACARIANS, in *Ecclesiastical History*, the followers of Macarius, an Egyptian monk, who, towards the close of the fourth century, was distinguished for his sanctity and virtue. In his writings there are some superstitious tenets, and also certain opinions which seem tainted with Origenism. The name has also been applied to those who adopted the sentiments of Macarius, a native of Ireland, who about the close of the ninth century propagated in France the error afterwards maintained by Averrocs, that one individual intelligence or soul performed the spiritual and rational functions in all the human race.

MACARONIC, a kind of burlesque poetry, consisting of a jumble of different languages, with words of the vulgar tongue Latinized, and Latin words modernized. *Macaroni*, amongst the Italians, as has been observed by Cælius Rhodiginus, signifies *a coarse clownish man;* and because this kind of poetry is patched up out of several languages, and full of extravagant words and combinations, the Italians, amongst whom it took its rise, gave it the name of *macaronic* poetry. Others, however, derive the name *a macaronibus*, from *macaroons*, a kind of confection made of meal not boulted, sweet almonds, sugar, and the white of eggs, and accounted a great dainty amongst the country people in Italy; which circumstance occasioned this kind of poetry, which consists of Latin, Italian, Spanish, French, English, and other languages, and is thus composed of various ingredients, to be called by the same name or appellation. Thus a bold fellow, in the *macaronic* style, says,

> Enfilavi omnes scadrones et regimandos.

And the following is in the same vein;

> Archelos pistoliferos furiamque manantum,
> Et grandem esmeutam quæ inopinum facta ruelle est:
> Toxinumque alto troublantem corda clochero, &c.

Theophilus Folengius, a Benedictine monk of Mantua, was the first who invented, or at least cultivated, this kind of verse. The best pieces of the Macaronic kind are, the *Baldus* of Folengio, and *Macaronis Forza* by Stefonio, a Jesuit, amongst the Italians; and the *Reatus veritabilis, super terribili esmeuta Paisanarum de Ruellis*, amongst the French. The famous Rabelais first transferred the *macaronic* style out of Italian verse into French prose, and upon this model formed some of the best things in his *Pantagruel.* We have but little in English in the *macaronic* style; and nothing scarce, excepting some little loose pieces collected in Camden's remains. But the Germans and people of the Netherlands have had their macaronic poets; for instance, the *Certamen Catholicum cum Calvinistis* of Martinius Hamconius Frisius, which contains about 1200 verses, all the words of which begin with the letter C.

MACASSAR, the chief settlement of the Dutch in the island of Celebes, named by them first Rotterdam, and situated on the south-west coast of the island. The fort is about half a mile from the beach, opposite to the road, where a pier extends which serves for unloading the ships, and close to which there are fifteen or sixteen feet of water. The walls of the fort are high and strong, being built of rock stone. Without is a large plain, on the north side of which is situated the town, where most of the Europeans reside. The Chinese live all together in one street, which is named after them. The Portuguese obtained permission to establish themselves here in 1525; but they were expelled by the Dutch in 1660, who hold the first and surrounding district in consequence of a treaty entered into with the native prince. The English in 1815 established a factory, which, however, they were soon under the necessity of abandoning. Numerous Chinese are settled here, who carry on a considerable trade with their native country. Macassar was formerly an extensive kingdom, which, before its conquest by the Dutch, comprehended a great extent of coast. The Straits of Macassar separate the island of Borneo from Celebes. They extend about 300 miles from north to south, and in average breadth 126 miles, excepting at the northern extremity, where it contracts to about sixty miles. It is of very dangerous navigation, abounding with shoals, rocks, and rocky islands, and in January and February a strong current is forced through this strait to the southward by the north winds.

MACAU, a town of France, in the department of the Gironde and arrondissement of Bordeaux, situated on the left bank of the Garonne, and containing 1800 inhabitants.

MACCABEES, two apocryphal books of Scripture, containing the history of Judas and his brothers, and their wars against the Syrian kings in defence of their religion and liberties, so called from Judas Mattathias, surnamed *Maccabæus*, as some say from the word מכבי, formed of the initials of מי כמכה כאלם יהוה, *Who is like unto thee, O Lord, amongst the gods*, which was the motto of his standard; and hence those who combated under his banner were called *Maccabees*, and the name was generally applied to all who had suffered in the cause of the true religion, under the Egyptian or Syrian kings. The first book of the Maccabees is an excellent history, and comes the nearest to the style and manner of the sacred historians. It was originally written in the Chaldaic tongue, and was extant in that language in the time of St Jerome. From the Chaldaic it was translated into Greek, from the Greek into the Latin. It is supposed to have been written by John Hyrcanus, the son of Simon, who was prince and high priest of the Jews for nearly thirty years, and began his government at the time where this history ends. It contains the history of forty years, from the reign of Antiochus Epiphanes to the death of Simon the high priest; that is, from the year of the world 3829 to the year 3869, or 131 years before Christ. The second book of the Maccabees begins with two epistles sent from the Jews of Jerusalem to the Jews of Egypt and Alexandria, to exhort them to observe the feast of the dedication of the new altar erected by Judas on his purification of the temple. The first was written in the 169th year of the era of the Seleucidæ, that is, 144 before Christ; and the second in the 188th year of the same era, or 125 before Christ. After these epistles follows the preface of the author to his history, which is an abridgment of a larger work, composed by one Jason, a Jew of Cyrene, who wrote in Greek the history of Judas Maccabæus and his brethren, and the wars against Antiochus Epiphanes, and Eupator his son. The second book does not by any means equal the accuracy and excellence of the first. It contains a history of about fifteen years, from the execution of the commission of Heliodorus, who was sent by Seleucus to fetch away the treasures of the temple, to the victory obtained by Judas Maccabæus over Nicanor; that is, from the year of the world 3828 to the year 3843, or 147 years before Christ.

There are in the Polyglot Bibles, both of Paris and London, Syriac versions of both these books; but they, as well as the English versions which we have amongst the apocryphal books in our Bible, are all derived from the Greek. There is also a third book of the Maccabees, containing the history of the persecution of Ptolemy Philopator against the Jews in Egypt, and their sufferings under it, which appears to have been written by some Alexandrian Jew in the Greek language, not long after the time of Siracides. It is in most of the ancient manuscript copies of the Greek Septuagint, particularly in the Alexandrian and the Vatican, but was never inserted into the vulgar Latin version of the

Bible, nor consequently into any of our English copies. Moreover, Josephus's history of the martyrs who suffered under Antiochus Epiphanes is found in some manuscript Greek Bibles, under the appellation of the fourth book of the *Maccabees*.

MACBETH, a Scotch nobleman in the eleventh century, nearly allied to Duncan, king of Scotland. Not contented with curbing the king's authority, he carried his ambition so far as to put him to death; and, chasing Malcolm Ceanmore his son and heir into England, usurped the crown. But Siward, earl of Northumberland, whose daughter Duncan had married, undertook, by the order of Edward the Confessor, the protection of the fugitive prince; marched with an army into Scotland; defeated and killed Macbeth; and restored Malcolm Greathead to the throne of his ancestors. Shakspeare has made this transaction the subject of one of his best tragedies.

MACCLESFIELD, a large market-town of the county of Chester, in the hundred of its own name, 168 miles north-west by north from London. It is pleasantly situated on an eminence at a short distance from the river Bollin. Many of the buildings in the principal streets are of a superior order. The town is lighted by gas, and well supplied with water derived from a spring on the neighbouring common. The river Bollin passes through the lower part of the town, and although the stream is small, it turns several mills. There are three established churches in the town, several dissenting places of worship, and a chapel for Roman Catholics. There is likewise a free grammar school, endowed with landed property of the yearly value of L.500, and a national school, with several Sunday schools. By the new municipal act, the town is divided into six wards; and the civil government is vested in a mayor, twelve aldermen, and thirty-six councillors. The justices of the peace are seven, one of them being the mayor for the time being. It returns two members to the House of Commons. There are markets on Monday and Saturday, which are well supplied. It was long celebrated for making buttons, silk-twist, sewing-silk, and bands for hats; but of late years these have been superseded by those of silk and cotton goods of various descriptions. The number and magnitude of the factories, as stated below, demonstrate the extent and importance of these manufactures, as connected with this town. There are also iron and brass founderies, nail factories, rope and twine works, and hat manufactories. The number of silk mills in the town, and in the remaining part of Prestbury parish, amounts to fifty-eight (eighteen of them being unemployed at the present time, 1836), and they furnish employment to 2429 males and 3525 females. The number of cotton mills is fourteen, employing 1370 males and 1429 females. The population amounted in 1801 to 8743, in 1811 to 12,999, in 1821 to 17,746, and in 1831 to 23,129.

Macedonia.

MACEDONIA, or MACEDON, a celebrated kingdom of antiquity, was bounded on the east by the Ægean Sea, on the south by Thessaly and Epirus, on the west by the Ionian Sea or Adriatic, on the north, at first by the river Strymon and the Scardian Mountains, but afterwards by the river Nessus or Nestus. In a direct line the whole country extended only 150 miles; but it was lengthened out to about three times that extent by the windings of the coast, in which almost every convenient situation was converted into a Grecian sea-port. The country was naturally divided, by the Thermaic and Strymonic Gulfs, into the provinces of Pieria, Chalcis, and Pangæus. The middle region, which took its name from a city of Eubœa, whence it had been originally peopled, was very fertile and pleasant; and the interior, being diversified by lakes, rivers, and arms of the sea, was extremely convenient for inland navigation, whilst the towns of Amphipolis, Potidæa, Acanthus, and many others, afforded marts for the commerce of the republics of Greece, as well as of Thrace and Macedonia. On one side of this district were the mountains of Pangæus, and on the other the plains of Pieria. The Pangæan Mountains, which extended ninety miles towards the east and the river Nessus, though proper neither for corn nor pasture, produced plenty of timber for ship-building; whilst the southern branches of the mountains contained rich veins of gold and silver; but these, though wrought successively by the Thasians and the Athenians, were only brought to perfection by Philip of Macedonia, who extracted from them gold and silver to the value of about L.200,000 sterling annually. Pieria extended fifty miles along the Thermaic Gulf, as far as the confines of Thessaly and Mount Pindus. The inland part of the country was beautifully diversified with shady hills and with fountains; and so admirably calculated for solitary walks and retirement, that the ancients looked upon it as the favourite haunts of the Muses, and accordingly bestowed upon them the title of *Pierides*.

Different names.

In the most ancient times this country was called *Æmathia*, from Æmathius, one of its princes. The name of *Macedonia* is said to have been derived from Macedo, a descendant of Deucalion; though others suppose it to have been only a corruption of *Mygdonia*, a district of the country. In those remote ages of antiquity, Macedonia, like most other countries of Europe, was divided into a great number of petty principalities, of which scarcely even the names are now known.

Kingdom founded by Caranus.

All authors agree, however, that Caranus was the first who established any permanent sovereignty in Macedonia. He was an Argive, a descendant of Hercules, and, about 800 years before Christ, conducted a small colony of his countrymen into the inland district of Macedonia, at that time distinguished by the name of Æmathia, as already mentioned. This territory was about 300 miles in circumference. On the south it was separated from the sea by a number of Greek republics, of which the most considerable were those of Olynthus and Amphipolis; and on the north, the east, and the west, it was surrounded by the barbarous kingdoms of Thrace, Pœonia, and Illyricum. According to the traditions of those times, Caranus having consulted the oracle respecting the success of his intended expedition, was commanded to follow the direction of the goats in the establishment of his empire. For some time he proceeded at random, without knowing what to make of the oracle's answer; but happening to enter the small kingdom of Æmathia, at that time governed by king Midas, he observed a herd of goats running towards Edessa, the capital. Recollecting the answer of the oracle, he then attacked and took the city by surprise, and soon afterwards made himself master of the whole kingdom. In memory of this remarkable event, he called the city *Ægæ*, and the people *Ægiates*, from the goats who conducted him, and made use of the figure of a goat for his standard. From this fable also we see why the figure of a goat is so frequently found on the coins of Philip and his successors.

But the little colony of Argives led into Æmathia by Caranus would soon have been overwhelmed by the barbarous nations who surrounded it, had not this prince and his subjects taken care to ingratiate themselves with their neighbours, rather than to attempt to subdue them by force of arms. They instructed them in the Greek religion and government, and in the knowledge of many useful arts; adopting themselves, in some degree, the language and manners of the barbarians, and imparting to them in return some portion of Grecian civilization. Thus they gradually associated with the fierce and warlike tribes in their neighbourhood; and this prudent conduct, being followed by succeeding generations, may be looked upon as one of the causes of the Macedonian greatness.

Perdiccas I.

Caranus dying after a short reign of three years, left the kingdom to his son Cœnus, who having considerably enlarged his dominions, was succeeded by Thurymas, and he again by Perdiccas I. This last prince is by Thucydides and Herodotus accounted the founder of the Macedonian monarchy, though his history is so obscured by fable that nothing certain can now be known concerning it. In process of time, however, the good understanding which had subsisted between the Macedonians and their barbarous neighbours began to suffer interruption, and in 691 B. C. the kingdom was for the first time invaded by the Illyrians. At first they did considerable damage by their ravages; but the Macedonian monarch Argæus having decoyed them into an ambush, cut off great numbers, and obliged the remainder to leave the kingdom. In the reign of his successors, however, they returned, and occasionally proved very troublesome enemies, till the reigns of Philip and Alexander.

Persians and Macedonians.

In the mean time, the kingdom of Macedonia began to be affected by those great events which had taken place in other parts of the world. Cyrus having overthrown the Babylonian empire, and conquered all the western part of Asia, established a mighty monarchy, which threatened the eastern parts of Europe with complete subjugation. The Greeks, however, having now emerged from barbarism, and acquired great knowledge in the art of war, were able effectually to resist this very formidable power; but the kingdom of Macedonia, obscure and unconnected, was obliged to yield, and though not formally made a province of the Persian empire, was nevertheless accounted in some sort as under the vassalage and protection of the Persians. Alcetas, who ascended the Macedonian throne about the time that the Persian monarchy was founded, had the dexterity to preserve his dominions from the encroachments of the Greeks on the one hand, and of the Persians on the other; but in the reign of his successor Amyntas, a formal demand was made of submission to the great king Darius, by sending him a present of earth and water. Seven ambassadors were sent upon this errand by Megabizus, one of the officers of Darius. They were sumptuously entertained by Amyntas; but having attempted to take some indecent liberties with the Macedonian women, Alexander, the king's son, caused them all to be put to death. This hasty retribution had almost proved the ruin of the kingdom; but Alexander found means to pacify Bubaris, the general sent against him by Megabizus, by showing him his sister Gygæa, a very beautiful woman, with whom the Persian fell in love at first sight, and afterwards married her.

From this time the Macedonians were accounted the faithful allies of the Persians; and Amyntas, through the interest of his son-in-law, obtained the country in the neighbourhood of Mount Hæmus and Olympus, at the same time that the city of Alabanda in Phrygia was given to Amyntas, the nephew of Alexander. The Macedonians distinguished themselves in the time of the Persian invasion of Greece, by furnishing their allies with 200,000 recruits; though some cities, particularly Potidæa, Olynthus, and Pallene, adhered to the Grecian interest. The last two were taken and razed, and the inhabitants massacred by the Persians; but Potidæa escaped by reason of the sea breaking into the Persian camp, where it did great damage. Alexander, however, afterwards thought proper to court the favour of the Greeks, by giving them intelligence of the time when Mardonius designed to attack them. The remaining transactions of this reign are entirely unknown, further than that the king enlarged his dominions as far as the river Nessus on the east, and the Axius on the west.

Reign of Perdiccas II.

Alexander I. was succeeded by his son Perdiccas II. who is said to have inherited his father's abilities, though not his integrity. From the duplicity with which he acted, both to the Greeks and the Persians, it does not appear indeed that he had much to boast of as to the latter quality. In the Peloponnesian war he espoused the cause of the Spartans against the Athenians, from whom he was in danger by reason of their numerous settlements on the Macedonian coast, and their great power by sea. For some time, however, he amused the Athenians with a show of friendship; but at last, under pretence of enabling Olynthus and some other cities to recover their liberties, he assisted in destroying the influence of the Athenians in those places, hoping to establish that of the Macedonians in its stead. But this design failed of success; the Olynthian confederacy was broken up; and the members of it became subject to Sparta, until at last, by the misfortunes of that republic, they grew sufficiently powerful, not only to resist the encroachments of the Macedonians, but to make considerable conquests in their country.

Archelaus I.

Perdiccas II. was succeeded about 416 B. C. by Archelaus I. He enlarged his dominions by the conquest of Pydna, and other places in Pieria, though his ambition seems rather to have been to improve his dominions than greatly to extend them. He facilitated the communication between the principal towns of Macedonia, by cutting straight roads through most part of the country; he built walls and fortresses in such places as afforded favourable situations; he encouraged agriculture and the arts, particularly those subservient to war; he formed magazines of arms; he raised and disciplined a considerable body of cavalry; and, in a word, he added more to the solid grandeur of Macedonia than had been done by all his predecessors put together. Nor was he regardless of the arts of peace. His palace was adorned by the works of the Grecian painters. Euripides was long entertained at his court; Socrates was earnestly solicited to live there, after the example of this philosophic poet, formed by his precepts, and cherished by his friendship; men of merit and genius in the various walks of literature and science were invited to reside in Macedonia, and treated with distinguished regard by a monarch equally attentive to advance his own glory and promote the happiness of his subjects.

Civil dissensions.

This great monarch died after a reign of six years, a space by far too short to accomplish the magnificent projects he had formed. After his death the kingdom fell under the power of usurpers, or of weak and wicked monarchs. A number of competitors constantly appeared for the throne; and these by turns called to their assistance the Thracians, Illyrians, Thessalians, the Olynthian confederacy, Athens, Sparta, and Thebes. Bardyllis, an active and daring chief, who, from being the head of a gang of robbers, had become sovereign of the Illyrians, entered Macedonia at the head of a numerous army; deposed Amyntas II. the father of Philip; and set up in his stead one Argæus, who consented to become tributary to the Illyrians. Another candidate for the throne, named Pausanias, was supported by the Thracians; but, by the assistance of the Thessalians and Olynthians, Amyntas was at length enabled to resume the government. After his restoration, however, the Olynthians refused to deliver up several places of importance belonging to Macedonia, which Amyntas had either intrusted to their care, or which they had taken from his antagonist. Amyntas complained to Sparta; and that republic, which had already formed schemes of very extensive ambition, so readily complied with the request, that it was generally supposed to have proceeded from Spartan emissaries sent into Macedonia. They pretended indeed to hesitate a little, and to take time to deliberate as to the army which ought to be raised for the purpose; but Cleigenes, the principal ambassador, so strongly represented the urgency of the case, that the troops which happened at that time to be ready were ordered to take the field without delay. Two thousand Spartans, under the command of Eudamidas, were ordered into Macedonia, whilst a powerful reinforcement under the command of Phœbidas, brother of the general, was ordered to follow him as soon as possible. By accident, Phœbidas and his auxiliaries were detained till the season for action had passed; but Eudamidas with his small army performed essential service. The appearance of a Spartan army at once encouraged the subjects and allies of the Olynthians to revolt; and the city of Potidæa, a place of great importance in the isthmus of Pallene, surrendered soon after his arrival in the country. Elated with his success, Eudamidas approached so near the city of Olynthus, that he was unexpectedly attacked, defeated, and killed, in a sally of the citizens. He was succeeded by Teleutias, brother of Agesilaus, who had under his command a body of ten thousand men, and was further assisted by Amyntas king of Macedonia, and Derdas his brother, the governor or sovereign of the most westerly province of Macedonia, which abounded in cavalry. By these formidable enemies the Olynthians were discomfited in a series of battles, obliged to shut themselves up in their city, and prevented from cultivating their territory; upon which Teleutias advanced with his whole forces to invest the city itself. But his excessive eagerness to destroy his enemies proved his ruin. A body of Olynthian horse had the boldness to pass the river Amnias in sight of the allied army, though so much superior in number. Teleutias ordered his targeteers to attack them, and the Olynthians retreated across the river, closely pursued by the Lacedæmonians, a great part of whom also crossed the river; but the Olynthians suddenly turned upon them, and killed upwards of one hundred, with Tlemonidas their leader. Teleutias, exasperated at this disaster, ordered the remainder of the targeteers and cavalry to pursue, whilst he himself advanced at the head of the heavy-armed foot with such celerity, that they began to fall into disorder. The Olynthians allowed them to come on, and the Lacedæmonians imprudently advanced under the towers and battlements of the city. The townsmen then mounted the walls, and discharged upon them a shower of darts, arrows, and other missile weapons, whilst the flower of the Olynthian troops, who had been purposely posted behind the gates, sallied forth and attacked them with the greatest fury. Teleutias, attempting to rally his men, was slain in the first onset; the Spartans who attended him were defeated, and the whole army dispersed with great slaughter, and obliged to shelter themselves in the towns of Acanthus, Apollonia, Spartolus, and Potidæa.

The Spartans, undismayed by this disaster, next sent their king Agesipolis with a powerful reinforcement into Macedonia. His presence greatly raised the spirits of the Lacedæmonian allies, and his rapid success seemed to promise a speedy termination to the war, when he himself died of a calenture. He was succeeded in the throne by his brother Cleombrotus, and in the command of the army by Polybiades, an old, experienced general, who likewise brought along with him a powerful reinforcement. Olynthus was now completely blocked up by land, whilst a squadron of Lacedæmonian galleys blockaded the neighbouring harbour of Myceberna. The Olynthians, however, held out for nine or ten months, but were at last obliged to submit on very humiliating conditions. They formally renounced all claim to the dominion of Chalcis, and ceded the Macedonian cities to their ancient governor; and in consequence of this Amyntas left the city of Ægæ or Edessa, where till now he had held his royal residence, and fixed it at Pella, a city of great strength and beauty, situated upon an eminence, which, together with a plain of considerable extent, was defended by impassable morasses, and also by the rivers Axius and Lydias. It was distant about fifteen miles from the Ægean Sea, with which it communicated by means of the above-mentioned rivers. It was originally founded by the Greeks, who had conquered and peopled it; but, in consequence of the misfortunes of Olynthus, it now became, and continued ever after to be, the capital of Macedonia.

Macedonia.

Pausanias; Ptolemy.

Amyntas being thus established in his dominions, continued to enjoy tranquillity during the remaining part of his life. The reign of his son Alexander was short, and disturbed by invasions of the Illyrians, from whom he was obliged to purchase a peace. He left behind him two brothers, Perdiccas and Philip, both very young, so that Pausanias again found means to usurp the throne, being supported not only by the Thracians, but by a considerable number of Greek mercenaries, as well as a powerful party in Macedonia itself. In this critical juncture, however, Iphicrates the Athenian happening to be on an expedition to Amphipolis, was so warmly addressed by Eurydice, the widow of Amyntas, in behalf of her two sons, whom she presented to him, that he interested himself in their behalf, and got Perdiccas, the eldest, established on the throne. He was induced to perform this act of generosity by the kindness which Eurydice and her husband had formerly shown to himself; and he likewise perceived the advantages which must ensue to his country from a connection with Macedonia. During the minority of the young prince, however, his brother Ptolemy, who was his guardian, openly aspired to the throne; but he was deposed by the Theban general Pelopidas, who reinstated Perdiccas in his dominions, and, in order to secure the dependence of Macedonia upon Thebes, carried along with him thirty Macedonian youths as hostages, amongst whom was Philip, the younger brother of the king. Perdiccas, elated by the protection of such powerful allies, now forgot Iphicrates and the Athenians, and even disputed with them the right to the city of Amphipolis, which had been decreed to them by the general council of Greece, but which his opposition rendered it impossible for them to recover. From the trust he put in these new allies, it is probable that he refused to Bardyllis the Illyrian the tribute the Macedonians had been obliged to pay him; a circumstance which occasioned a war with that nation. In this contest the Macedonians were defeated with the loss of four thousand men, and Perdiccas himself was taken prisoner, and soon afterwards died of his wounds.

State of the kingdom.

The kingdom was now left in the most deplorable state. Amyntas, the legitimate heir to the throne, was an infant; the Thebans, in whom Perdiccas had placed so much confidence, were deprived of the sovereignty of Greece; the Athenians, justly provoked at the ungrateful behaviour of the late monarch, showed a hostile disposition; the Illyrians ravaged the western, and the Pæonians the northern quarter of the kingdom; the Thracians still supported the cause of Pausanias, and proposed to send him into Macedonia at the head of a numerous army; whilst Argæus, the former rival of Amyntas, renewed his pretensions to the throne, and by flattering the Athenians with the hopes of recovering Amphipolis, easily induced them to support his claims, in consequence of which they fitted out a fleet, having on board three thousand heavy-armed soldiers, which they sent to the coast of Macedonia.

Arrival of Philip in Macedonia.

Philip, the late king's brother, no sooner heard of his defeat and death, than he set out privately from Thebes, and on his arrival in Macedonia found matters in the situation which we have just described. Fired with an insatiable ambition, it is probable that from the very first moment he had resolved to seize the kingdom for himself; yet it was necessary at first to pretend that he assumed the throne only to preserve it for his nephew. Philip, as has already been mentioned, had been carried off as a hostage by Pelopidas, but for a long time past had remained in such obscurity that historians are not agreed as to his place of residence, some placing him in Thebes, and others in Macedonia. It is certain, however, that from the age of fifteen he had been very much in the family of Epaminondas, from whose lessons he could not but derive the greatest advantage. It is also probable that he accompanied this celebrated general in many of his expeditions; and it is certain that, with an attendance suitable to his rank, he visited most of the principal republics, and paid great attention to their institutions, both civil and military. Having easy access to whomsoever he pleased, he cultivated the friendship of the first people in Greece. Even in Athens, where no good will subsisted to Macedonia, the philosophers Plato, Isocrates, and Aristotle, cultivated his acquaintance; and the connection he formed with the principal leaders of that republic in the early period of his life no doubt contributed greatly to the accomplishment of the designs in which he afterwards proved so successful.

Affairs of the kingdom retrieved by him.

His appearance in Macedonia instantly changed the face of affairs. The Macedonian army, though defeated, was not entirely destroyed; and the remainder of them secured themselves in the fortresses which had been built by Archelaus. There were also considerable garrisons in the fortresses, and walled towns scattered over the kingdom; and the Illyrians, who had made war only for the sake of plunder, soon returned home to enjoy the fruits of their victory. His other enemies, the Thracians and Pæonians, were much less formidable than the Illyrians, being still in a very rude and uncivilized state, incapable of uniting under one head in such a manner as to bring any formidable army into the field. Whilst the Illyrians therefore gave up the campaign through mere caprice and unsteadiness, Philip himself applied to the Pæonians, and by fair promises and flattery prevailed upon them to desist. The king of Thrace, by means of a sum of money, was easily prevailed upon to abandon the cause of Pausanias; so that Philip, freed from these barbarians, was now at liberty to oppose the Athenians, who supported Argæus, and threatened a very formidable invasion.

Philip assumes the sovereignty.

The appearance of the Athenian fleet before Methone, with that of Argæus at the head of a numerous army in Pieria, filled the whole country with consternation; and Philip, who was by no means deficient in the talents necessary to recommend himself to the good graces of the people, took the opportunity of getting Amyntas set aside, and himself declared king, for which proceeding indeed the danger of the times afforded a very plausible pretext. In the mean time, Argæus advanced with his Athenian allies towards Edessa or Ægæ, the ancient capital of the Macedonian empire, where he hoped to have been amicably received; but finding the gates shut against him, he returned back to Methone. Philip harassed him in his retreat, cutting off great numbers of his men, and afterwards defeated him in a general engagement, in which Argæus himself, with the flower of his army, was cut in pieces, and the rest taken prisoners. This first instance of success contributed greatly to raise the spirits of Philip's party; and he himself took care to improve it in the best manner possible. Having made a great number of prisoners, both Macedonians and Athenians, he determined, by his treatment of them, to ingratiate himself with both parties. The former were called into his presence, and, after a gentle reprimand, admitted to swear allegiance to him, after which they were distributed throughout the army. The Athenians were entertained at his table, and dismissed without ransom, and their baggage was restored to them. The prisoners were just allowed time to return to their native city, and to spread abroad the news of Philip's generosity, when they were followed by ambassadors from Macedonia with proposals for peace. As he knew that the loss of Amphipolis had greatly irritated them, he now thought proper to renounce his jurisdiction over that city. It was accordingly declared free and independent, and subject only to the government of its own free and equitable laws. This prudent conduct, together with his kind treatment of the prisoners, so wrought upon the minds of the Athenians, that they consented to the renewal of a treaty which had formerly subsisted between them and his father Amyntas. Thus he found means to remove all jealousy of his ambition, and to induce them to engage in a ruinous war with their allies, which occupied their attention until Philip had an opportunity of getting matters so well established that it was impossible to overthrow him.

The power of the nobility reduced.

The new king being thus at liberty to regulate his domestic concerns, began to circumscribe the power of his chiefs and nobles, who, especially in the more remote provinces, paid very little regard to the authority of the kings of Macedonia; sometimes, even in times of public calamity, throwing off their allegiance altogether, and assuming an independent jurisdiction over considerable tracts of country. To counteract the ambition of these chiefs, Philip chose a body of the bravest Macedonian youths, whom he entertained at his own table, and honoured with many testimonies of his friendship, giving them the title of his "companions," and allowing them constantly to attend him in war and hunting. Their intimacy with the sovereign, which was considered as a sure indication of their merit, obliged them to use superior diligence in all the severe duties of military discipline; and the young nobility, eager to participate in such high honours, vied with one another in their endeavours to gain admission into this distinguished order; so that whilst on the one hand they served as hostages, they formed on the other an useful seminary for future generals, by whom both Philip and Alexander were afterwards greatly assisted in their conquests.

The phalanx.

Diodorus Siculus, and all the Roman writers who have treated of the history of Greece, assert that Philip, in the first year of his reign, instituted the Macedonian phalanx; a body of six thousand men armed with short swords fitted either for cutting or thrusting, having also strong bucklers four feet long and two and a half broad, and pikes fourteen feet long, and usually marching sixteen men deep. But this opinion is controverted by others. Dr Gillies supposes that such an opinion had arisen from the Romans meeting with the phalanx in its most complete form in Macedonia; and as they became acquainted with Greece and Macedonia pretty nearly at the same time, it was natural for them to suppose that it had been invented amongst the Macedonians. The phalanx, he says, is nothing different from the armour and arrangement which had always prevailed amongst the Geeeks, and which Philip adopted in their most perfect form; "nor is there reason to think that a prince, who knew the danger of changing what the experience of ages had approved, made any alteration in the weapons or tactics of that people.[1] The improvement in the countermarch, to which Philip gave the appearance of advancing instead of retreating, mentioned by Ælian in his Tactics (cap. xxviii.), was borrowed, as this author tells us, from the Lacedæmonians. If Philip increased the phalanx, usually less numerous, to six thousand men, this was far from an improvement; and the latter kings of Macedonia, who swelled it to sixteen thousand, only rendered that order of battle more unwieldy and inconvenient." Instead of this, Philip, according to our author, employed himself in procuring arms, horses, and other necessary materials for war; and in introducing a more severe and exact military discipline than had formerly been known in Macedonia.

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[1] Dr Gillies is mistaken as to the constitution of the Macedonian phalanx, which was a deeper, more compact, and perfect formation than that which, under the same name, obtained amongst the Greeks. See the article **ARMY**.

Whilst the king thus took the best methods to render himself secure at home and formidable abroad, the Pæonians again began to make incursions into the kingdom. The death of Agis, their king, however, who was a man of great military skill, deprived them of almost all power of resistance when they were attacked. Philip, in consequence, overran their country with little opposition, and reduced them to the state of tributaries to Macedonia. No sooner was this accomplished, than he undertook a winter's campaign against the Illyrians, who had long been the natural enemies of Macedonia. They had now extended their territory to the east, by which means the Macedonians were excluded from the harbours upon the coast of the Adriatic. This was a grievance to Philip, who seems early to have meditated the formation of a naval force; neither could he hope to be in safety, should the kingdom be left open to the incursions of a barbarous enemy; for which reason he determined at once to humble those enemies in such a manner that they should no longer be in a situation to give him any disturbance. After an ineffectual negociation, he was met by Bardyllis at the head of a considerable body of infantry, but with only four hundred horse. They made a gallant resistance for some time; but being unable to contend with so skilful a general as Philip, they were defeated with the loss of seven thousand men, amongst whom was their leader Bardyllis, who fell at the age of ninety.

By this disaster the Illyrians were so much disheartened, that they sent ambassadors to Philip, humbly begging for peace upon any terms. The conqueror granted them the same conditions which had been imposed upon the Pæonians, viz. becoming tributary, and yielding up to him a considerable part of their country. That part of it which lay to the eastward of a lake named Lychnidus he annexed to Macedonia, and probably built a town and settled a colony there, the country being fertile, and the lake abounding with many kinds of fish highly esteemed by the ancients. This town and lake were about fifty miles distant from the Ionian Sea; and such was the ascendency which the arms and policy of Philip acquired over his neighbours, that the inhabitants of all the intermediate district soon adopted the language and manners of their conquerors; whilst their territory, hitherto unconnected with any foreign power, sunk into such absolute dependence upon Macedonia, that many ancient geographers supposed it to be a province of that country.

Philip had no sooner reduced the Illyrians, than he began to put in execution greater designs than any which he had yet attempted. The rich coasts to the southward of Macedonia, inhabited chiefly by Greeks, presented a strong temptation to his ambition and avarice. The confederacy of Olynthus, after having thrown off the yoke of Sparta, had become more powerful than ever, and could send into the field an army of ten thousand heavy-armed troops, besides a number of cavalry in proportion; most of the towns in Chalcidice had become its allies or subjects; whilst this populous and wealthy province, together with Pangæus on the right and Pieria on the left, of both which the cities were either independent or subject to the Athenians, formed a barrier sufficient to guard against any incursions of the Macedonians. But though Philip was sensible enough of the importance of those places, he considered the conquest of Amphipolis as more necessary at that time. By the possession of this place, Macedonia would be connected with the sea, and would be secured in many commercial advantages, which could not but contribute greatly to the prosperity of the kingdom at large; a road was likewise opened to the woods and mines of Pangæus, the former of which were so necessary to the formation of a naval force, and the latter for the establishment of a proper military force. This city had indeed been declared independent by Philip himself in the beginning of his reign; but this was only to prevent a rupture with the Athenians, who still asserted their right to it as an ancient colony, though, by reason of the perfidy of Charidemus, a native of Eubœa, they had hitherto failed in their attempts to recover it. The Amphipolitans, however, having once enjoyed the sweets of liberty, prepared to maintain themselves in their independence. In the mean time, the hostile designs of Philip, which all his precaution had not been able to conceal, alarmed the inhabitants to such a degree that they thought proper to put themselves under the protection of the Olynthians. By them they were readily received into the confederacy, and, trusting to the strength of their new allies, behaved in such an insolent manner to Philip, that he was not long in finding a specious pretext for hostility; on which the Olynthians, greatly alarmed, sent ambassadors to Athens, requesting their assistance against such a powerful enemy. Philip, however, justly alarmed at such a formidable conspiracy, sent agents to Athens with such expedition that they arrived there before any thing could be concluded with the Olynthian deputies. Having gained over the popular leaders and orators, he deceived and flattered the magistrates and senate in such an artful manner, that a negociation was instantly set on foot, by which Philip engaged to conquer Amphipolis for the Athenians, upon condition that they surrendered to him the strong fortress of Pydna, a place which he represented as of much less importance to them; promising also to confer upon them many other advantages, which, however, he did not specify at that time. Thus the Athenians, deceived by the perfidy of their own magistrates, elated with the hopes of recovering Amphipolis, and outwitted by the superior policy of Philip, rejected with disdain the proffers of the Olynthians.

The ambassadors of Olynthus returned home highly disgusted with the reception they had met with, but had scarcely time to communicate their news to their countrymen, when the ambassadors of Philip arrived at Olynthus. He pretended to condole with them on the affront they had received at Athens, but also testified his surprise that they should court the assistance of that distant and haughty republic, when they could avail themselves of the powerful kingdom of Macedonia, which wished for nothing more than to enter into equal and lasting engagements with their confederacy. As a proof of his moderation and sincerity, he offered to put them in possession of Anthemus, an important town in the neighbourhood, of which the Macedonians had long claimed the jurisdiction; making many other fair promises, and, amongst the rest, that he would reduce for them the cities of Pydna and Potidæa, which he chose rather to see in dependence on Olynthus than Athens. Thus he prevailed upon the Olynthians not only to abandon Amphipolis, but to assist him with all their power in the execution of his designs.

Philip now lost no time in executing his purposes against Amphipolis, and pressed the city so closely that the people were glad to apply to the Athenians for relief. Accordingly, they despatched two of their most eminent citizens, Hierax and Stratocles, to represent the danger of an alliance between Philip and the Olynthians, and to profess their sorrow for having so deeply offended the parent state. This representation had such an effect, that though the Athenians were then deeply engaged in the Social War, they would probably have paid some attention to the Amphipolitans, had not Philip taken care to send them a letter with fresh assurances of friendship, acknowledging their right to Amphipolis, and which he hoped shortly to put into their hands in terms of his recent agreement. By these specious pretences the Athenians were persuaded to pay as little regard to the deputies of the Amphipolitans as they had already done to those of the Olynthians; so that the city, unable to defend itself alone against so powerful an enemy, at last surrendered at discretion in the year 357 before Christ.

Philip still proceeded in the same cautious and politic manner in which he had commenced. Though the obstinate defence of the Amphipolitans might have furnished a pretence for severity, he contented himself with banishing a few of the popular leaders, from whom he had most cause to dread opposition, treating the rest of the inhabitants with all manner of clemency; but he took care to add Amphipolis to his own dominions, from which he was determined that it never should be separated, notwithstanding the promises he had made to the Athenians. Finding that it was not his interest at this time to fall out with the Olynthians, he cultivated the friendship of that republic with great assiduity; and took the cities of Pydna and Potidæa, which he readily yielded to the Olynthians, though they had given him but little assistance in the reduction of these places. Potidæa had been garrisoned by the Athenians, and them the artful king sent back without ransom, lamenting the necessity of his affairs, which obliged him, contrary to his inclination, to oppose their republic. Though this was rather too gross, the Athenians were then so much engaged with the Social War, that they had not leisure to attend to the affairs of other nations. Philip made the best use of his time, and next projected the conquest of the gold mines of Thrace. That rich and fertile country was now held by one Cotys, a prince of such weak intellectual faculties, that the superstition of the Greeks, into which he was newly initiated, had almost entirely subverted his reason, and he wandered about in quest of the goddess Minerva, with whom he fancied himself in love. The invasion of the Macedonians, however, awaked him from his reverie; and Cotys, finding himself destitute of other means of opposition, attempted to stop the progress of the enemy by a letter. To this Philip paid no regard, and the Thracians were instantly expelled from their possessions at Crenidæ, where there were very valuable gold mines. These had formerly been worked by colonies from Thasos and Athens; but the colonists had long since been expelled by the barbarous Thracians, who knew not how to make use of the treasure they were in possession of. Philip took the trouble to descend into the mines himself, in order to inspect the works; and, having caused them to be repaired, planted a Macedonian colony at Crenidæ, bestowed upon it the name of Philippi, and drew annually from the gold mines to the value of near 1000 talents, or L.200,000 sterling, an immense sum in those days. The coins struck here were likewise called Philippi.

The affairs of Thessaly settled.

Philip having obtained this valuable acquisition, next undertook to settle the affairs of Thessaly, where everything was in the greatest confusion. This country had been formerly oppressed by Alexander, tyrant of Pheræ, after whose death three others appeared, viz. Tissiphornus, Pitholaus, and Lycophron, the brothers-in-law of Alexander, who had likewise murdered him. By the united efforts of the Thessalians and Macedonians, however, these usurpers were easily overthrown, and effectually prevented from making any disturbances for the future; and the Thessalians, from a mistaken gratitude, surrendered to Philip all the revenues arising from their fairs and towns of commerce, as well as all the conveniences of their harbours and shipping; a concession which Philip took care to secure in the most effectual manner.

Having now not only established his sovereignty in the most effectual manner, but rendered himself very powerful and formidable to his neighbours, Philip determined to enjoy some repose from his fatigues. Having formed an alliance with Arybbas, king of Epirus, he, in the year 357 before Christ, married Olympias, the sister of that prince; a match thought the more eligible, as the kings of Epirus were supposed to be descended from Achilles. The nuptials were solemnized with great pomp at Pella, and several months were spent in shows and diversions, during which Philip showed such an extreme proneness to vice of every kind, as disgraced him in the eyes of his neighbours, and most probably laid the foundation of his future domestic unhappiness. So much was this behaviour of the Macedonian monarch taken notice of by the neighbouring states, that the Pæonians and Illyrians threw off the yoke, engaging in their schemes the king of Thrace; and, notwithstanding the insane state of that prince, their designs were now carried on with more judgment than was usual with barbarians. Philip, however, notwithstanding his dissipation, got warning of his danger in sufficient time to prevent the evil consequences which might have ensued had the confederates had time to bring their schemes to a proper bearing. Early in the spring of 356 he took the field with the flower of the Macedonian troops. Having marched in person against the Pæonians and Thracians, he despatched Parmenio, his best general, into Illyria. Both enterprises proved successful; and whilst Philip returned victorious from Thrace, he received an account of the victory gained by Parmenio; a second messenger informed him of a victory gained by his chariot at the Olympic games; and a third announced that Olympias had been delivered of a son at Pella.

A general combination against Philip.

Alexander the Great.

This was the celebrated Alexander, to whom the diviners prophesied the highest prosperity and glory, as being born in such auspicious circumstances. A short time after the birth of Alexander, Philip wrote a letter to the philosopher Aristotle, whom he chose as preceptor to his son. The letter was written with great brevity, containing only the following words: "Know that a son is born to us. We thank the gods not so much for their gift, as for bestowing it at a time when Aristotle lives. We assure ourselves that you will form him a prince worthy of his father, and worthy of Macedonia."

He next set about the further enlargement of his territories, which were already very considerable. Pæonia now formed one of his provinces; on the east his dominions extended to the sea of Thasos, and on the west to the lake Lychnidus. The Thessalians were in effect subject to his jurisdiction, and the possession of Amphipolis had secured him many commercial advantages. He had a numerous and well-disciplined army, with plentiful resources for supporting such an armament, and carrying through the other schemes suggested by his ambition, though his deep and impenetrable policy rendered him more truly formidable than all these put together. His first scheme was the reduction of Olynthus, the most populous and fertile country upon the borders of Macedonia, after which his ambition prompted him to aspire to the sovereignty of all Greece. To accomplish the former, he had hitherto courted the friendship of the Olynthians by every possible method; and without letting slip any opportunity to accomplish the latter, he gradually deprived the Athenians of several of their settlements in Thrace and Macedonia. In these depredations, however, he took care always to give such appearance of justice to his actions, that his antagonists, who had studied the matter less deeply, could not find a plausible pretext for engaging in war against him, even when he had openly committed hostilities against them. Philip easily perceived that the affairs of the Greeks were coming to a crisis, and he determined to watch the issue of their mutual dissensions. Nor did that result disappoint his expectations. The Phocians had violated the religion of those days in a most extraordinary manner; they had even ploughed up the lands consecrated to Apollo; and, however they might pretend to excuse themselves by examples, the Amphictyons fulminated a decree against them, commanding the sacred lands to be laid waste, and imposing a heavy fine upon the community.

By this decree all Greece was again involved in the war called *Phocian*, from the name of the city about which it commenced. Philip at the beginning of the troubles was engaged in Thrace, where a civil war had broken out amongst the sons of Cotys; and wherever Philip interfered, it was certain that matters turned out to his own advantage. His encroachments at length became so enormous, that Kersobletes, the most powerful of the contending princes, agreed to cede the Thracian Chersonesus to the Athenians, who immediately sent Chares at the head of a powerful armament to take possession of it. In this expedition the town of Sestos was taken by storm, and the inhabitants were cruelly treated by Chares, whilst Philip employed himself in the siege of Methone in Pieria. This city he likewise reduced; but the king lost an eye at the siege, and in a very extraordinary manner, if we may give credit to the accounts of some ancient historians. A celebrated archer, named Aster, had, it seems, offered his services to Philip, being represented as such an excellent marksman that he could hit the swiftest bird on the wing. Philip replied that he would be of excellent use if they were to make war with starlings. Aster, disgusted with this reception, went over to the enemy, and with an arrow wounded the king in the eye. When the weapon was extracted, it was found to be inscribed with these words: "For the right eye of Philip." The king ordered the arrow to be shot back again, with another inscription, importing that he would cause Aster to be hanged when the town was taken. A report was raised after Philip's death that he had lost his eye by prying too narrowly into the amours of Olympias and Jupiter Ammon, which the vanity of his successor prompted him to cherish, as his flatterers had probably been the inventors of it.

During all this time the Phocian war raged with the greatest fury, and involved in it all the states of Greece. Lycophron, one of the Thessalian tyrants whom Philip had formerly deprived of his authority, had again found means to re-establish himself; and his countrymen having taken part with the Phocians, Lycophron called in Onomarchus, the Phocian general, to protect him against the power of Philip, by whom he was sensible that he would soon be attacked. The king accordingly marched into Thessaly with a considerable army, and defeated Phyallus, the brother of Onomarchus, whom the latter had sent into the country with a detachment of seven thousand men. After this he besieged and took the city of Pegasæ, driving the enemy towards the frontiers of Phocis. Onomarchus then advanced with the whole army; and Philip, though inferior in numbers, did not decline the engagement. The Phocians at first gave ground, on which the Macedonians pursued, in good order; but coming near a precipice, on the top of which Onomarchus had posted a detachment of soldiers, the latter rolled down stones and fragments of the rock in such a manner as did dreadful execution, and threw them into the utmost disorder. Philip, however, rallied his troops with great presence of mind, and prevented the Phocians from gaining any further advantage; saying, as he withdrew his troops, that they did not retreat through fear, but only like rams, in order to strike with the greater vigour. Nor was he long before he made good his assertion; for, having recruited his army with the greatest expedition, he returned into Thessaly at the head of twenty thousand foot and five hundred horse, and was there met by Onomarchus. The Macedonians at this time were superior in number to their enemies; and Philip, moreover, took care to remind them that their quarrel was that of heaven, and that their enemies had been guilty of sacrilege, by profaning the temple of Delphi. That they might be still more animated in the cause, he put crowns of laurel on their heads. Thus fired with enthusiasm, and having besides the advantage of numbers, the Phocians were altogether unable to withstand them. They threw away their arms and fled towards the sea, where they expected to have been relieved by Chares, who, with the Athenian fleet, was near to the shore; but in this they were disappointed, for he made no attempt to save them. Upwards of six thousand perished in the field of battle or in the pursuit, and three thousand were taken prisoners. The body of Onomarchus being found amongst the slain, was by order of Philip hung upon a gibbet as a mark of infamy, on account of his having polluted the temple; and the bodies of the rest were thrown into the sea, as being all partakers of the same crime. The fate of the prisoners is not known, by reason of an ambiguity in a sentence of Diodorus Siculus, which may imply that they were drowned, though he does not expressly say so.

Philip pursues his ambitious schemes.

After this victory Philip set about the settlement of Thessaly, waiting only for an opportunity to put in execution his favourite scheme of invading Greece. In the mean time, he rejoiced to see the different states weakening each other by their mutual dissensions, of which he never failed to take advantage as far as possible. He now, however, began to throw off the mask with regard to the Olynthians, whom he had long deceived with fair promises. Having detached Kersobletes from the interest of the Athenians, he established him in the sovereignty of Thrace; not out of any good will, but with a view to destroy him whenever a proper opportunity should present itself. Were he once possessed of the dominions of that prince, the way to Byzantium was open to him, the possession of which must have been a great temptation to a prince who well knew how to value the importance of its situation both with respect to commerce and war; and in order to pave the way to this important conquest, he attacked the fortress of Heræum, a small, and in itself unimportant place, though, by reason of its neighbourhood to Byzantium, a highly valuable acquisition. The Athenians, however, at last began to perceive the designs of Philip, and determined to counteract them. For this purpose they entered into an alliance with Olynthus; and having warned Kersobletes of his danger, they ordered a powerful fleet to the defence of Heræum. But these vigorous measures were soon counteracted by the report of Philip's death, which had been occasioned by his wound at Methone, and a distemper arising from the fatigues which he had afterwards undergone. The inconstant Athenians too easily gave credit to this report, and, as if all danger had been over with his death, discontinued their preparations, and directed their whole attention to the Sacred War. This contest, instead of being ended by the death of Onomarchus, now raged with redoubled fury. Phyallus, above mentioned, the only surviving brother of Onomarchus, undertook the cause of the Phocians; and his affairs becoming every day more and more desperate, he took the most unaccountable method of retrieving them which could be imagined, having converted into ready money the most precious materials belonging to the temple at Delphi, and with this treasure doubled the pay of his soldiers. By this new piece of sacrilege he indeed brought many adventurers to his standard, though he cut off all hopes of mercy for himself or his party should he be defeated. Having the assistance of a thousand Lacedæmonians, two thousand Achæans, and five thousand Athenian infantry, with four hundred cavalry, he was still enabled to make a very formidable appearance; and the Phocians took the field with every prospect of success.

Designs of Philip against Greece.

Philip now thought it time to throw off the mask entirely, for which the proceedings of the Athenians, particularly their league with Olynthus, furnished him with a plausible pretext; and the revenging such horrid sacrilege as had been committed at Delphi seemed to give him a title to march at the head of an army into Greece. The superstition of the Greeks, however, had not yet blinded them to such a degree but they could easily perceive that Philip's piety was a mere pretence, and that his real design was to invade and conquer the whole country. The Athenians no sooner heard of the march of the Macedonian army, than they despatched with all expedition a strong guard to secure the pass of Thermopylæ; so that Philip was obliged to return greatly chagrined and disappointed. Their next step was to call an assembly to deliberate upon the measures proper to be taken in order to restrain the ambition of the Macedonian monarch; and this assembly is rendered memorable by the first appearance of Demosthenes as an orator against Philip. Athens had for some time been in a very alarming situation. They were deeply involved in the Sacred War; their northern possessions were continually insulted and plundered by Philip; whilst a number of his mercenary partisans drew off the public attention to such a degree, that, instead of taking measures to counteract that ambitious prince, they amused themselves with speculations about the designs of the Persian monarch, who was preparing for war against the Cyprians, Egyptians, and Phœnicians. Isocrates the celebrated orator, and Phocion the statesman, joined the multitude in their opinion, though not from any servile or mercenary motives, but purely from a sense of the unsteady conduct of the Athenians, who, they were assured, could not contend with a prince of the vigour and activity of Philip, and therefore exhorted them by all means to cultivate the friendship of a king whom they could not oppose with any probability of success. Isocrates, indeed, greatly wished for an expedition into Asia, and looked upon Philip as the only general capable of conducting it, though at present the Greeks had no pretence for making war upon the Persians, except that of revenging former injuries. On this subject he addressed a discourse to Philip himself; and it is even said that Isocrates, by the power of his rhetoric, prevailed upon Philip and the Athenians to lay aside for a short time their animosities, and consent to undertake this expedition in conjunction.

Demosthenes.

If this coalition, however, did really take place, it was of but very short duration. The views of Phocion and Isocrates were violently opposed by Demosthenes. Though sensible of the corruption and degeneracy of his countrymen, he hoped to be able to rouse them from their lethargy by dint of his eloquence; a talent he had been at great pains to cultivate, and in which he is said to have excelled all men that ever existed. In his first addresses to the people, this celebrated orator exhorted them to awake from their indolence, and to assume the direction of their own affairs. They had been too long governed, he said, by the incapacity of a few ambitious men, to the great disadvantage as well as disgrace of the community. In the first place, an orator who had placed himself at the head of a faction of no more than three or at the most four hundred, availed himself and his followers of the carelessness and negligence of the people, to rule them at pleasure. From a consideration of their present weakness and corruption, as well as of the designs and commotions of the neighbouring powers, he advised them to abandon all romantic and distant schemes of ambition; and, instead of carrying their arms into remote countries, to prepare for repelling the attacks which might be made upon their own dominions. He insisted also upon a better regulation of their finances; a more equal distribution of the public burdens, in proportion to the abilities of those upon whom they were laid, and the retrenchment of many superfluous expenses. Having pointed out in a strong light the vigorous conduct of Philip, and shown by what means he had attained to such a respectable footing in the world, he next laid down a proper plan for their military operations. He told them that they were not yet prepared to meet Philip in the field. They must begin with protecting Olynthus and the Chersonesus, for which it would be necessary to raise a body of two thousand light-armed troops, with a due proportion of cavalry, which ought to be transported under a proper convoy to the islands of Lemnos, Thasos, and Sciathos, in the neighbourhood of Macedonia. In these they would enjoy all kinds of necessaries in abundance, and might avail themselves of every favourable incident to appear at the first summons of their allies, and either to repel the incursions of the Macedonians, or harass their territories. Whilst this was going on, more vigorous preparations might be made for war at home; and it was proposed that only the fourth part of the Athenian citizens should enlist, and no more supplies were wanted at present but ninety talents. But notwithstanding the moderation of these proposals, and the urgent necessities of the state, it was impossible to prevail upon the indolent and careless Athenians to provide for their own safety. They appear, indeed, at this time, to have been desperately sunk in effeminacy and dissipation; a disposition which Philip took care to encourage to the utmost of his power. There was an assembly in the city called the Sixty, from their consisting originally of that number, who met expressly for the purposes of extinguishing all care about public affairs, and of intoxicating themselves with every kind of pleasure which they had in their power. With this assembly Philip was so well pleased, that he sent them money to support their extravagances; and so effectually did they answer his purposes, that all the eloquence of Demosthenes could not counteract the speeches of much inferior orators when their eloquence was backed by Macedonian gold.

Philip himself, as we have already hinted, was excessively debauched in his private character, and the most shameful stories are related of him by the ancient writers, particularly by Demosthenes. Theopompus, too, an author who flourished in the time of Alexander, and was rewarded and honoured by that monarch, also speaks of him in terms which cannot be mentioned with decency; but these accounts, coming from the avowed enemies of the king, are scarcely to be credited; and perhaps policy, as well as inclination, might contribute somewhat to this scandalous behaviour, that he might thereby recommend himself to the libertines of Athens, and prevent even many of the more thinking part of the people from suspecting his designs. But in whatever excesses he might at times indulge, he never once lost sight of his main object, the subjugation of the Greek states. On pretence of being in want of money to defray the expense of his buildings, he borrowed money at a very high price throughout the whole country; and this he found an easy matter to do, as the dissipation of the Delphic treasures had rendered cash very plentiful in Greece. Thus he attached his creditors firmly to his own interest; and, on pretence of paying debts, was enabled, without molestation, to bestow a number of pensions and gratuities upon the Athenian orators, who by their treacherous harangues contributed greatly to the ruin of their country; at least as far as it could be ruined by subjection to a prince who would have obliged them to remain at peace, and apply themselves to the useful arts. These he himself encouraged in a very eminent degree. The greater part of his time was employed at Pella, which city he adorned in the most magnificent manner, with temples, theatres, and porticos. He invited by liberal rewards the most ingenious artists to be found in Greece; and as many of these met with very little encouragement in their own country, great numbers flocked to him from all quarters. In the government of his people, also, Philip behaved with the utmost impartiality; listening with condescension to the complaints of the meanest of his subjects, and keeping up a constant correspondence with those whom he thought worthy of his acquaintance; from which it is not easy to imagine how he could be guilty of the vices which have been imputed to him by some of the ancient historians.

The fate of Olynthus was now soon determined. This city, which held the balance of power between Athens and Macedonia, was taken and plundered, and the inhabitants sold as slaves; but the chief hope of Philip was in putting an end to the Phocian war. For this purpose he affected a neutrality, that he might thereby become the arbiter of Greece. His hopes were well founded; for the Thebans, who were at the head of the league against the Phocians, solicited him on the one side, and the states confederated with the Phocians did the same on the other. He answered neither, yet held both in dependence. In his heart he favoured the Thebans, or rather placed his hopes of advancing his own cause on that state; for he well knew that the Athenians, Spartans, and other states allied with Phocis, would never allow him to pass Thermopylæ, and lead an army into their territories. So much respect, however, did he show to the ambassadors from these states, particularly Ctesiphon and Phrynon, who came from Athens, that they believed him to be in their interest, and reported as much to their masters. The Athenians, who were now dissolved in ease and luxury, received this news with great satisfaction, and immediately named ten plenipotentiaries to go and treat of a full and lasting peace with Philip. Amongst these plenipotentiaries were Demosthenes and Æschines, the most celebrated orators in Athens. Philip gave directions that these ambassadors should be treated with the utmost civility, naming, at the same time, three of his ministers to confer with them, namely, Antipater, Parmenio, and Eurylochus. Demosthenes being obliged to return to Athens, recommended it to his colleagues not to carry on their negociations with Philip's deputies, but to proceed with all diligence to court, there to confer with the king himself. The ambassadors, however, were so far from following his instructions, that they suffered themselves to be put off for three months by the arts of Philip and his ministers.

In the mean time, the king took from the Athenians such places in Thrace as might best cover his frontiers, giving their plenipotentiaries, instead of them, abundance of fair promises, and the strongest assurances that his good will should be as beneficial to them as ever their colonies had been. At last a peace was concluded; but then the ratification of it was deferred until Philip had obtained possession of Pherea in Thessaly, and saw himself at the head of a numerous army; then he ratified the treaty, and dismissed the plenipotentiaries with assurances that he would be ready at all times to give the Athenians proofs of his friendship. On their return to Athens, when this matter came to be debated before the people, Demosthenes plainly told them that, in his opinion, the promises of Philip ought not to be relied on, because they appeared to be of little significance in themselves, and came from a prince of so much art, and so little fidelity, that they could derive no authority from their maker. Æschines, on the other hand, gave it as his opinion, that the king of Macedonia's assurances ought to give full satisfaction. He said, that, for his own part, he was not politician enough to see any thing of disguise or dissimulation in the king's conduct; that there was great danger in distrusting princes; and that the surest method of putting men upon deceit was to show that we suspected them of it. In this the rest of the plenipotentiaries concurred with Æschines; and the people, being desirous of quiet, and addicted to pleasure, easily gave credit to all that was said, and decreed that the peace should be maintained. All this was the more easily brought about, because Phocion, the worthiest man in the republic, did not oppose Philip, which was owing to his entertaining a just sense of the actual state of his country. He conceived that the Athenians of those times were nothing like their ancestors; and therefore, as he expressed himself upon another occasion, he was desirous, since they would not be at the head of Greece themselves, that they should at least be upon good terms with that power which would unquestionably be so.

End of the Phocian war.

Philip, who knew how to use as well as to procure opportunity, whilst the Athenians were in this good humour, passed Thermopylæ, without their knowing whether he would fall upon Phocis or Thebes; but he quickly undeceived them, by commanding his soldiers to put on crowns of laurel, declaring them thereby the troops of Apollo, and himself the lieutenant-general of that god. He then entered Phocis with an air of triumph, which so terrified the Phocians, whom he had caused to be denounced as sacrilegious persons, that they immediately dismissed all thoughts of defence, and without more ado submitted to his mercy. Thus the Phocian war, which had so long employed all Greece, was ended without a stroke, and the judgment on the Phocians remitted to the Amphictyonic or grand council of Greece. By their decree, the walls of three Phocian cities were demolished, the people were forbidden to inhabit any but villages, and ordered to pay a yearly tribute of sixty talents, and never to make use either of horses or arms till they had repaid to the temple of Apollo the money they had sacrilegiously carried from thence. Their arms were taken from them, broken to pieces, and burned; and their double voice in the council was taken from them, and given to the Macedonians. Other orders were made for settling the affairs both of religion and the state throughout Greece, all of which were executed by Philip with great exactness and moderation; he paying the most profound respect to the council, and, when he had performed its commands, retiring peaceably with his army back to Macedonia, which gained him great reputation.

At Athens alone the justice and piety of Philip were not understood. The people began to see, though a little too late, that they had been abused and deceived by those who had negociated the late peace. They saw that, through their acceptance of it, the Phocians were destroyed; that Philip, having become master of Thermopylæ, might enter Greece when he pleased; that, in abandoning their allies, they had abandoned themselves; and that, in all probability, they might soon feel the weight of his power, whom they had so foolishly trusted. They therefore began to take new and hostile measures; they ordered that the women should retire out of the villages into the city, that their walls should be repaired, and their forts strengthened. They seemed inclined to question Philip's election into the council of the Amphictyons, because it had been done without their consent; and even to proceed to an open war. In all likelihood, they would have carried things to extravagance, if Demosthenes had not interposed. He told them, that though he was not for making the peace, he was however for keeping it; and that he saw no occasion whatever for their entering into so unequal a contest as would necessarily ensue if they took up arms, not only against Philip, but also against all the states which had concurred with him in the late transactions. This seems to have cooled the rage of the Athenians, and to have brought them to think of ruining Philip gradually, as they had raised him.

The fame of his achievements beyond the bounds of Macedonia having disposed the subjects of Philip to hope every thing from his conduct, and the several states of Greece to desire above all things his friendship, that prudent monarch laid hold of this favourable situation to fix his dominion upon such a stable foundation as that a reverse of fortune should not immediately destroy it. To this end, whilst he carried on his negociations through

Greece, he likewise kept his army in exercise, by taking several places in Thrace, which terribly incommoded the Athenians. Diopithes, who had the government of the Athenian colonies in those parts, perceiving well what end Philip had in view, did not stay for instructions from home, but, having with much expedition raised a considerable body of troops, took advantage of the king's being absent with his army, entered the adjacent territories of Philip, and wasted them with fire and sword.

The king, who, on account of the operations of the campaign in the Chersonesus, was not at leisure to repel Diopithes by force, nor indeed could divide his army without imminent hazard, chose, like an able general, rather to abandon his provinces to insults, which might be afterwards revenged, than, by following the dictates of an ill-timed resentment, to hazard the loss of his veteran army, whereon depended all his hopes. He contented himself, therefore, with complaining to the Athenians of the conduct of Diopithes, who in a time of peace had entered his dominions, and committed such devastations as could scarcely have been justified in a time of war. His partisans supported this application with all their eloquence. They told the Athenians, that unless they recalled Diopithes, and brought him to trial for this infringement of the peace, they ought not to hope either for the friendship of Philip, or that of any other prince or state; neither could they justly complain, if, prompted by such a precedent, others should break faith with them, and fall without the least notice upon their dominions. Demosthenes defended Diopithes, and undertook to show that he deserved the praise and not the censure of the Athenians. Those of the other party began then to charge him with crimes of a different nature; they alleged that he had oppressed the subjects and maltreated the allies of Athens. Demosthenes replied, that of these things there were as yet no proofs; that when such should appear, a single galley might be sent to bring over Diopithes to abide their judgment, but that Philip would not come if they sent a fleet; whence he inferred, that they ought to be cautious, and to weigh well the merits of this cause before they took any resolution. He said, that it was true Philip had not as yet attacked Attica, or pretended to make a descent on their territories in Greece, or to force his way into their ports: when it came to that, he was of opinion they would be hardly able to defend themselves; therefore he thought such men were to be esteemed as sought to protect their frontiers, in order to keep Philip as long as might be at a distance. Upon this he moved, that, instead of disowning what Diopithes had done, or directing him to dismiss his army, they should send him over recruits, and show the king of Macedonia that they knew how to protect their territories, and to maintain the dignity of their state, as well as their ancestors. These arguments had such an effect, that a decree was made conformable to his motion.

Whilst affairs stood thus, the Illyrians, recovering courage, and seeing Philip at such a distance, harassed the frontiers of Macedonia, and threatened a formidable invasion; but Philip, by quick marches, arrived on the borders of Illyricum, and struck this barbarous people with such a panic, that they were glad to compound for their former depredations at the price he was pleased to fix. Most of the Greek cities in Thrace now sought the friendship of the king, and entered into a league with him for their mutual defence. As it cannot be supposed that each of these free cities had a power equal to that of Philip, we may therefore look upon him as their protector. About this time Philip's negociations in the Peloponnesus began to come to light; the Argives and Messenians, growing weary of that tyrannical authority which the Spartans had exercised over them, applied to Thebes for assistance; and the Thebans, out of their natural aversion to Sparta, sought to open a passage for Philip into the Peloponnesus, that, in conjunction with them, he might humble the Lacedæmonians. Philip readily accepted the offer, and resolved to procure a decree from the Amphictyons, directing the Lacedæmonians to leave Argos and Messene free; which, if they complied not with, he, as the lieutenant of the Amphictyons, might, with great appearance of justice, march with a body of troops to enforce their order. When Sparta received intelligence of this, she immediately applied to Athens, earnestly entreating assistance, as in the common cause of Greece. The Argives and Messenians, on the other hand, laboured assiduously to gain the Athenians to their side, alleging that, if they were friends to liberty, they ought to assist those whose only aim was to be free. Demosthenes, at this juncture, outwrestled Philip, if we may borrow that king's expression; for, by a vehement harangue, he not only determined his own citizens to become the avowed enemies of the king, but also made the Argives and Messenians not over fond of him as an ally; which, when Philip perceived, he laid aside all thoughts of this enterprise for the present, and began to practise on Eubœa.

This country, now called *Negropont*, is separated from Greece by the Euripus, a strait so narrow that Eubœa might easily be united to the continent. This situation made Philip call it "the fetters of Greece," which he therefore sought to have in his own hands. There had been for some years great disturbances in that country; under colour of which, Philip sent forces thither, and demolished Porthmos, the strongest city in those parts, leaving the whole country under the government of three lords, whom Demosthenes roundly calls tyrants established by Philip. Shortly after, the Macedonians took Oreus, which was left under the government of five magistrates, also styled tyrants at Athens. Thither Plutarch of Eretria, one of the most eminent persons in Eubœa, went to represent the distresses of his country, and to implore the Athenians to set it free. This suit Demosthenes recommended warmly to the people, who sent thither their famous leader Phocion, supported by formidable votes, but a very slender army; yet so well did he manage the affairs of the commonwealth and her allies, that Philip quickly found he must for a time abandon that project; which, however, he did not until he had formed another no less beneficial to himself, or less dangerous to Athens. It was the prosecution of his conquests in Thrace, which he thought of pushing much further than he had hitherto done, or could be reasonably suspected to have any intention of doing.

Extraordinary preparations were made by the Macedonian monarch for this campaign. His son Alexander was left regent of the kingdom; and he himself with thirty thousand men laid siege to Perinthus, one of the strongest cities in the country. At that time, however, all his arts of cajoling and pretending friendship were insufficient to deceive the Athenians. They gave the command of their army and fleet to Phocion, a general of great abilities, and with whom Philip would have found it very hard to contend. On the other hand, the king of Persia began to turn jealous of the growing power of the Macedonian monarch. The Persian kings had been accustomed to regard those of Macedonia as their faithful allies; but the good fortune of Philip, the continual clamour of the Athenians against him, and his dethroning at pleasure the petty princes of Thrace, made him now be regarded in another light. When, therefore, he led his troops against Perinthus, the Great King, as he was styled by the Greeks, sent his letters mandatory to the governors of the maritime provinces, directing them to supply the place with all things in their power; in consequence of which they filled it with troops, granted subsidies in ready money, and sent besides great convoys of provision and ammunition. The Byzantines also, supposing that their turn would be next, exerted their utmost endeavours for the preservation of Perinthus, sending thither the flower of their youth, with all other necessaries for an obstinate defence. The consequence of all this was, that Philip found himself obliged to raise the siege with great loss.

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That the reputation of the Macedonian arms might not sink by this disgrace, Philip made war on the Scythians and Triballi, both of whom he defeated; and then formed a design of invading Attica, though he had no fleet to transport his troops, and knew very well that the Thessalians were not to be depended upon if he attempted to march through the Pisæ, and that the Thebans would even then be ready to oppose his march. To obviate all these difficulties, he had recourse to Athens itself, where, by means of his hired partisans, he procured his old friend Æschines to be sent their deputy to the Amphictyons. This seemed a small matter, and yet was the hinge on which his whole project turned. By the time Æschines had taken his seat, a question was stirred in the council, whether the Locrians of Amphisia had not been guilty of sacrilege in ploughing the fields of Cyrrha in the neighbourhood of the temple of Delphi. The assembly being divided in their opinions, Æschines proposed to take a view of the ground, which was accordingly decreed. But when the Amphictyons came in order to see how things stood, the Locrians, either jealous of their property, or spurred thereto by the suggestions of some who saw farther than themselves, fell upon those venerable persons so rudely, that they were compelled to secure themselves by flight. The Amphictyons decreed that an army should be raised, under the command of one of their own number, to chastise the delinquents; but as this army was to be composed of troops sent from all parts of Greece, the appearance at the rendezvous was so inconsiderable, that the Amphictyons sent to command them durst not undertake anything. The whole matter being reported to the council, Æschines, in a long and eloquent harangue, showed how much the welfare and even the safety of Greece depended on the deference paid to their decrees; and after inveighing against the want of public spirit in such as had not sent their quotas at the time appointed by the council, he moved that they should elect Philip as their general, and pray him to execute their decree. The deputies from the other states, conceiving that by this expedient their respective constituents would be free from any further trouble or expense, agreed to it at once; upon which a decree was immediately drawn up, purporting that ambassadors should be sent to Philip of Macedonia, in the name of Apollo and the Amphictyons, once more to require his assistance, and to notify to him, that the states of Greece had unanimously chosen him their general, with full power to act as he thought fit against such as had opposed the authority of the Amphictyons. Thus of a sudden Philip acquired all that he sought; and having an army ready in expectation of this event, he immediately marched in appearance to execute the commands of the Amphictyons, but in reality to accomplish his own designs; for having passed into Greece with his army, instead of attacking the Locrians, he immediately seized upon Elatea, a great city of Phocis, situated on the river Cephisus.

tle of
ronæa.

The Athenians in the mean time were in the utmost confusion on the news of Philip's march. However, by the advice of Demosthenes, they invited the Thebans to join them against the common enemy of Greece. Philip endeavoured as much as possible to prevent this confederacy from taking place, but all his efforts proved ineffectual. The Athenians raised an army, which immediately marched to Eleusis, where they were joined by the Thebans. The confederates made the best appearance that had ever been seen in Greece, and the troops were exceedingly good; but, unfortunately, the generals were men of no conduct or skill in the military art. An engagement ensued at Cheronæa, in which Alexander commanded one wing of the Macedonian army, and his father Philip the other. The confederate army was divided according to the different nations of which it consisted; the Athenians having the right, and the Bœotians the left. In the beginning of the battle the confederates had the advantage; whereupon Stratocles, an Athenian commander, cried out, "Come on, brother soldiers, let us drive them back to Macedonia," which being overheard by the king, he said very coolly to one of his officers, "These Athenians do not know how to conquer." Upon this he directed the files of the phalanx to be closed up, and retired to a neighbouring eminence, from which, when the Athenians were eager in their pursuit, he rushed down with impetuosity, broke, and routed them with prodigious slaughter. The orator Demosthenes behaved very unbecomingly in this engagement, for he deserted his post, and was one of the first who fled; nay, we are told, that a stake catching hold of his robe, he, not doubting that it was an enemy, ignominiously cried out, "Spare my life."

Philip is appointed general against the Persians.

The victory of Cheronæa determined the fate of Greece; and from this time we must reckon Philip supreme lord of all the Grecian states. The first use he made of his power was to convoke a general assembly, in which he was recognised as generalissimo, and with full power appointed their leader against the Persians. Having, by virtue of his authority, settled a general peace amongst them, and appointed the quota that each of the states should furnish for the war, he dismissed them, and returning to Macedonia, began to make great preparations for this new expedition. His pretence for making war on the Persians at this time was the assistance given by the Persians to the city of Perinthus, as already mentioned. In the mean time, however, the king, by reason of the dissensions which reigned in his family, was rendered quite miserable. He quarrelled with his wife Olympias to such a degree, that he divorced her, and married another woman named Cleopatra. This produced a quarrel between him and his son Alexander, which at length reached to such a height that Alexander retired into Epirus with his mother. Some time afterwards, however, he was recalled, and a reconciliation took place in appearance; but in the mean time a conspiracy was secretly formed against the king's life, the real causes and circumstances of which are very little known. Certain it is, however, that it took effect as the king was exhibiting certain shows in honour of his daughter's marriage with the king of Epirus. Philip having given a public audience to the ambassadors of Greece, went next day in great state to the theatre. All the seats were early occupied; and the shows began with a splendid procession, in which the images of the twelve superior deities of Greece were carried, as also the image of Philip, habited in like manner, as if he now made the thirteenth, at which the people shouted aloud. Then came the king alone, in a white robe, crowned, with his guards at a considerable distance, that the Greeks might see he placed his safety only in his confidence of the loyalty of his subjects. Pausanias, the assassin, however, had fixed himself close by the door of the theatre; and observing that all things fell out as he had foreseen they would, took his opportunity when the king drew near him, and plunging his sword in his left side, laid him dead at his feet. He then fled as fast as he was able towards the place where his horses were, and would have escaped, had not the twig of a vine caught his shoe and thrown him down. This gave time to those who pursued him to come up with him; but instead of securing him, in order to extort a discovery of his accomplices, they put an end to his life.

Character of Philip.

With regard to the character of this monarch, it appears certain that he was one of the most eminent persons that ever sat upon a throne. Had he lived for some time longer, he would in all probability have subdued the Persians; an achievement less difficult than many which he had already accomplished. Had that event taken place, the undertakings of his long and successful reign would have been ennobled and illuminated by the splendour of extensive foreign conquest. Philip would have reached that height of renown which is obtained by the habits of activity, vigilance, and fortitude, in the pursuit of unbounded greatness; and, in the opinion of posterity, would perhaps have surpassed the glory of all kings and conquerors who either preceded or followed him. Yet, even on this supposition, there is not any man of sense and probity, who, if he allows himself time for serious reflection, would purchase the imagined grandeur and prosperity of the king of Macedonia at the price of his artifices and his crimes; and to a philosopher, who considered either the means by which he had obtained his triumphs, or the probable consequences of his dominion over Greece and Asia, the busy ambition of this mighty conqueror would appear but a deceitful scene of splendid misery.

Joy of the Athenians.

No sooner did the news of Philip's death reach Athens, than, as if all danger had been past, the inhabitants showed the most extravagant signs of joy. Demosthenes and his party put on chaplets of flowers, and behaved as if they had gained a great victory. Phocion reproved them for this madness; bidding them remember, that "the army which had beaten them at Cheronæa was lessened but by one." This reproof, however, had very little effect. The people heard with pleasure all the harsh things which the orators could say of the young Alexander, king of Macedonia, whom they represented as a giddy wrong-headed boy, ready to grasp all things in his imagination, and able to perform nothing. The affairs of Macedonia indeed were in a very distracted state on the accession of Alexander; for all the neighbouring nations had the same notion of the young king with the Athenians, and, being irritated by the usurpations of Philip, immediately revolted; and the states of Greece entered into a confederacy against him. The Persians had been contriving how to transfer the war to Macedonia; but as soon as the news of Philip's death reached them, they behaved as if all danger had been terminated. At the same time Attalus, one of the Macedonian commanders, aspired to the crown, and sought to draw off the soldiers from their allegiance.

Alexander declared general of Greece.

In the councils held upon this occasion, Alexander's best friends advised him rather to make use of dissimulation than force, and to try to cajole those whom they thought he could not subdue. These advices, however, were ill suited to the temper of their monarch. He thought that vigorous measures only were proper, and therefore immediately led his army into Thessaly. Here he harangued the princes so effectually, that he thoroughly gained them over to his interest, and was by them declared general of Greece; upon which he returned to Macedonia, where he caused Attalus to be seized and put to death.

In the spring of the next year (335 before Christ), Alexander resolved to subdue the Triballians and Illyrians, who inhabited the countries now called Bulgaria and Sclavonia, and had been very formidable enemies to the Macedonian power. In this expedition he discovered, though then but twenty years of age, a surprising degree of military knowledge. Having advanced to the passes of Mount Hæmus (the Balkan), he learned that the barbarians had posted themselves in the most advantageous manner. Upon the tops of the cliffs, and at the head of every passage, they had placed their carriages and waggons in such a manner as to form a kind of parapet, with their shafts inwards, that when the Macedonians should have half ascended the rock, they might be able to push these heavy carriages down upon them; and they reckoned the more upon this contrivance, because of the close order of the phalanx, which, they imagined, would be terribly exposed by the soldiers wanting room to stir, and thereby to avoid the falling waggons. But Alexander, having directed his heavy-armed troops to march, gave orders, that, where the way would permit, they should open to the right and left, and suffer the carriages to go through; but that, in the narrow passes, they should throw themselves on their faces with their shields behind them, that the carts might run over them. This had the desired effect, and the Macedonians reached the enemy's works without the loss of a man. The dispute was then quickly decided. The barbarians were driven from their posts with great slaughter, and left behind them a considerable booty for the conquerors.

Thebes taken and destroyed.

The next exploits of Alexander were against the Getæ, the Tanlantii, and some other nations inhabiting the country upon the other side of the Danube. These he also overcame; showing in all his actions the most perfect skill in military affairs, joined with the greatest valour. In the mean time, however, all Greece was thrown into commotion by a report which had been confidently spread abroad, that the king was dead in Illyria. The Thebans, on this news, seized Amyntas and Timolaus, two eminent officers in the Macedonian garrison which held their citadel, and dragged them to the market-place, where they were put to death without either form of process, or any crime being alleged against them. Alexander, however, did not suffer them to remain long in their mistake. He marched with such expedition, that in seven days he reached Pallene in Thessaly; and in six days more he entered Bœotia, before the Thebans had any intelligence of his having passed the Straits of Thermopylæ. Even then they would not believe that the king was alive, but insisted that the Macedonian army was commanded by Antipater, or by one Alexander the son of Æropus. The rest of the Greeks, however, were not so hard of belief, and therefore sent no assistance to the Thebans, who were thus obliged to bear the consequences of their own folly and obstinacy. Their city was taken by assault, and the inhabitants were for some hours massacred without distinction of age or sex; after which the houses were demolished, excepting that of Pindar the famous poet, which was spared out of respect to the merit of its owner, and because he had celebrated Alexander king of Macedonia. The lands, except those destined to religious uses, were shared amongst the soldiers, and all the prisoners sold as slaves, by which 440 talents were brought into the king's treasury.

Number of the army with which he invaded Asia.

By this severity the rest of the Grecian states were so thoroughly humbled, that they thought no more of making any resistance, and Alexander had nothing further to hinder him from pursuing his favourite project of invading Asia. Very little preparation was necessary for the Macedonian monarch, who went as to an assured conquest, and reckoned upon being supplied chiefly by the spoils of his enemies. Historians are not agreed as to the number of his army. Arrian says, that there were thirty thousand foot and five thousand horse. Diodorus Siculus informs us that there were thirteen thousand Macedonian foot, seven thousand of the confederate states, and five thousand mercenaries, under the command of Parmenio. Of the Odrisians, Triballians, and Illyrians, there were five thousand; and of the Agrians, who were armed only with darts, one thousand. As for the horse, he tells us there were eighteen hundred commanded by Philotas, and as many Thessalians under the command of Callas. Out of the confederate states of Greece there were six hundred commanded by Eurygius; and nine hundred Thracians and Pæonians, who led the van under Cassander. Plutarch tells us, that, according to a moderate computation, Alexander had thirty thousand foot and five thousand horse; and that, according to the largest estimate, he had thirty-four thousand foot and four thousand horse. As to his fund for the payment of the army, Aristobulus says it was but seventy talents; and Onesicritus, who was also present in this expedition, not only takes away the seventy talents, but affirms that the king was two hundred in debt. As for provisions, there was just sufficient for a month and no more; and to prevent disturbances, Antipater was left in Macedonia with twelve thousand foot and fifteen hundred horse.

The army having assembled at Amphipolis, Alexander marched thence to the mouths of the river Strymon; then crossing Mount Pangæus, he took the road to Abdera. Crossing the river Ebrus, he proceeded through the country of Pætis, and in twenty days reached Sestos; thence he marched to Eleus, where he sacrificed on the tomb of Protesilaus, because he was the first amongst the Greeks who at the siege of Troy set foot upon the Asiatic shore. He did this, that his landing might be more propitious than that of the hero to whom he sacrificed, who was soon afterwards slain. The greatest part of the army, under the command of Parmenio, embarked at Sestos, on board of a fleet of a hundred and sixty galleys of three benches of oars, besides small craft. Alexander himself sailed from Eleus; and when he was in the middle of the Hellespont, offered a bull to Neptune and the Nereids, pouring forth at the same time a libation from a golden cup. When he drew near to the shore, he launched a javelin, which stuck in the earth; then, in complete armour, he leaped upon the strand; and having erected altars to Jupiter, Minerva, and Hercules, he proceeded to Ilium. Here again he sacrificed to Minerva; and taking down some arms which had hung in the temple of that goddess since the time of the Trojan war, he consecrated his own in their stead. He sacrificed also to the ghost of Priam, to avert his wrath on account of the descent which he himself claimed from Achilles.

In the mean time the Persians had assembled a great army in Phrygia, amongst whom was one Memnon, a Rhodian, the best officer in the service of Darius. Alexander, as soon as he had performed all the ceremonies which he judged necessary, marched directly towards the enemy. Memnon gave it as his opinion that they should burn and destroy all the country round, that they might deprive the Greeks of the means of subsisting, and then transport a part of their army into Macedonia. But the Persians, depending on their cavalry, rejected this salutary advice, and posted themselves along the river Granicus, in order to await the arrival of Alexander. In the engagement which ensued on the banks of that river, the Persians were defeated, and Alexander became master of all the neighbouring country, which he immediately began to take care of, as if it had been part of his hereditary dominions. The city of Sardis was immediately delivered up; and here Alexander built a temple to Jupiter Olympius. After this, he restored the Ephesians to their liberty, ordered the tribute which they formerly paid to the Persians to be applied towards the rebuilding the magnificent temple of Diana, and having settled the affairs of the city, marched against Miletus. This place was defended by Memnon with a considerable body of troops who had fled thither after the battle of Granicus, and therefore made a vigorous resistance. The fortune of Alexander, however, prevailed; and the city was soon reduced, though Memnon with part of the troops escaped to Halicarnassus. After this, the king dismissed his fleet; a proceeding for which various causes have been assigned, though it is probable, that the chief reason was to show his army that their only resource now lay in subverting the Persian empire.

Almost all the cities between Miletus and Halicarnassus submitted as soon as they heard that the former was taken; but Halicarnassus, where Memnon commanded with a very numerous garrison, made an obstinate defence. Nothing, however, was capable of resisting the Macedonian army. Memnon was at last obliged to abandon the place; upon which Alexander took and razed the city of Tralles in Phrygia, received the submission of several princes tributary to the Persians; and having destroyed the Marmarians, a people of Lycia who had fallen upon the rear of his army, put an end to the campaign; after which he sent home all the new married men, in obedience, it would seem, to a precept of the Mosaic law, and which endeared him more to his soldiers than almost any other action of his life.

As soon as the season would permit, Alexander quitted the province of Phaselus; and having sent part of his army through the mountainous country to Perga, by a short but difficult road, took his route by a certain promontory, where the way is altogether impassable except when the north winds blow. At the time of the king's march the south wind had held for a long time; but of a sudden it changed, and blew from the north so violently, that, as he and his followers declared, they obtained a safe and easy passage, through divine assistance. By many this march is considered as miraculous, and compared to that of the children of Israel through the Red Sea; whilst, on the other hand, it is the opinion of others, that there was nothing at all extraordinary in it. He continued his march towards Gordium, a city of Phrygia; the enemy having abandoned the strong pass of Telmissus, through which it was necessary for him to march. When he arrived at Gordium, and found himself under the necessity of staying there some time till the several corps of his army could be re-united, he expressed a strong desire of seeing Gordius's chariot, and the famous knot in the harness, of which such strange stories had been published to the world. The cord in which this knot was tied was made of the inner rind of the cornel tree; and no eye could perceive where it began or ended. Alexander, when he could find no possible way of untying, and yet was unwilling to leave it tied, lest it should cause some fears in the breasts of his soldiers, is said by some authors to have cut the cords with his sword, saying "it matters not how it is undone." But Aristobulus assures us, that the king wrested a wooden pin out of the beam of the waggon, which, being driven in across the beam, held it up, and so took the yoke from under it. Be this as it may, however, Arrian informs us, that a great tempest of thunder, lightning, and rain, happening the succeeding night, it was held declarative of the true solution of this knot, and that Alexander would become master of Asia.

Alexander's sickness and recovery.

The king having left Gordium, marched towards Cilicia, where he was attended with his usual good fortune, the Persians abandoning all the strong passes as he advanced. As soon as he entered the province, he received advice that Arsames, whom Darius had made governor of Tarsus, was about to abandon it, and that the inhabitants were very apprehensive that he intended to plunder them before he withdrew. To prevent this, the king marched incessantly, and arrived just in time to save the city. But his saving it had well nigh cost him his life; for, either through the excessive fatigue of marching, as some say, or, according to others, by his plunging when very hot into the river Cydnus, which, as it runs through thick shades, has its waters excessively cold, he fell into such a distemper as threatened immediate dissolution. His army lost their spirits; the generals, perplexed, knew not what to do; and his physicians were so much affrighted, that the terror of his death hindered them from using the necessary methods for preserving his life. Philip the Acarnanian alone preserved self-command enough to examine the nature of the king's disease, the worst symptom of which was a continual shivering, which he removed by means of a potion, and in a short time the king recovered his usual health.

Battle of Issus.

Soon after Alexander's recovery, he received the agreeable news that Ptolemy and Asander had defeated the Persian generals, and made great conquests on the Hellespont; and a little after that he met the Persian army at Issus, commanded by Darius himself. A bloody engagement ensued, in which the Persians were defeated with great slaughter. The consequences of this victory were very advantageous to the Macedonians. Many governors of provinces, and petty princes, submitted themselves to the conqueror; and such as did so were treated, not as a newly conquered people, but as his old hereditary subjects, being neither burdened with soldiers nor oppressed with tribute. Amongst the number of those places which, within a short space after the battle of Issus, sent deputies to submit to the conqueror, was the city of Tyre. The king, whose name was Azelmicus, was absent in the Persian fleet; but his son was amongst the deputies, and was very favourably received by Alexander. The king probably intended to confer particular honours upon the city of Tyre, for he acquainted the inhabitants that he would come and sacrifice to the Tyrian Hercules, the patron of their city, to whom they had erected a most magnificent temple. But these people, like most other trading nations, were far too suspicious to think of admitting such an enterprising prince with his troops within their walls. They therefore sent their deputies again to him to inform him that they were ready to do whatever he should command them; but as to his coming and sacrificing in their city, they could not consent to that, but were positively determined not to admit a single Macedonian within their gates. Alexander immediately dismissed their deputies in great displeasure. He then assembled a council of war, in which he insisted strongly on the disaffected state of Greece (for most of the Grecian states had sent ambassadors to Darius, to enter into a league with him against the Macedonians), the power of the Persians by sea, and the folly of carrying on the war in distant provinces, whilst Tyre was left unreduced behind them; he also remarked, that if once this city was subdued, the sovereignty of the sea would be transferred to them, because it would fix their possession of the coasts; and as the Persian fleet was composed chiefly of tributary squadrons, those tributaries would fight the battles, not of their late, but of their present masters.

Tyre taken and destroyed.

For these reasons the siege of Tyre was resolved on. The town was not taken, however, without great difficulty; which provoked Alexander to such a degree that he treated the inhabitants with the greatest cruelty. (See TYRE.) After the reduction of Tyre, Alexander, though the season was already far advanced, resolved to make an expedition into Syria; and in his way thither proposed to chastise the Jews, who had highly offended him during the siege of Tyre; for when he sent to them to demand provisions for his soldiers, they answered, that they were the subjects of Darius, and bound by oath not to supply his enemies. The king, however, was pacified by their submission, and not only pardoned them, but conferred many privileges upon them.

Egypt submits.

From Jerusalem Alexander marched directly to Gaza, the only place in that part of the world which still held out for Darius. This was a very large and strong city, situated upon a very high hill, about five miles from the sea-shore. One Batis or Betis, an eunuch, had the government of the place, and had made every preparation necessary for sustaining a long and obstinate siege. The governor defended the place with great valour, and several times repulsed his enemies; but at last it was taken by storm, and all the garrison slain to a man; and this secured to Alexander an entrance into Egypt, which having before been very impatient of the Persian yoke, admitted the Macedonians peaceably. Here the king laid the foundations of the city of Alexandria, which for many years afterwards continued to be the capital of the country. Whilst he remained here, he also formed the singular design of visiting the temple of Jupiter Ammon. As to the motives by which he was induced to take this extraordinary journey, authors are not agreed; but certain it is, that he hazarded himself and his troops in the highest degree, there being two dangers in this march, which, with the example before him of Cambyses, who lost the greater part of his army in it, might have terrified any body but Alexander. The first was the want of water, which, in the sandy deserts surrounding the temple, is nowhere to be found; the other, the uncertainty of the road from the fluctuation of the sands, which, changing their situation every moment, leave the traveller neither a road to walk in, nor a mark to march by. These difficulties, however, Alexander overcame, though not without a miraculous interposition, as is pretended by all his historians.

Battle of Arbela.

Alexander having consulted the oracle, and received a favourable answer, returned to pursue his conquests. Having settled the government of Egypt, he appointed the general rendezvous of his forces at Tyre. Here he met with ambassadors from Athens, requesting him to pardon such of their countrymen as he found serving the enemy. The king, being desirous to oblige such a famous state, granted their request; and also sent a fleet to the coast of Greece, to prevent the effects of some commotions which had lately happened in Peloponnesus. He then directed his march to Thapsacus; and having passed the Euphrates and Tigris, met with Darius near Arbela, where the Persians were again overthrown with prodigious slaughter, and by this victory Alexander became in effect master of the Persian empire.

Babylon, Susa, and Persepolis, reduced.

After this important victory, Alexander marched directly to Babylon, which was immediately delivered up; the inhabitants being greatly disaffected to the Persian interest. After thirty days' stay in this country, the king marched to Susa, which had already surrendered to Philoxenus; and here he received the treasures of the Persian monarch, amounting, according to the most generally received account, to fifty thousand talents. Having received also at this time a supply of six thousand foot and five hundred horse from Macedonia, he set about reducing the nations of Media, amongst whom Darius had retired. He first reduced the Uxians, and having forced a passage to Persepolis, the capital of the empire, he, like a barbarian, destroyed the stately palace there, a pile of building not to be equalled in any part of the world; after having given up the city to be plundered by his soldiers. In the palace he found one hundred and twenty thousand talents, which he appropriated to his own use, and caused immediately to be carried away upon mules and camels; for he had such an extreme aversion to the inhabitants of Persepolis, that he determined to leave nothing valuable in that city.

Alexander pursues Darius, who is murdered by Bessus.

During the time that Alexander remained at Persepolis, he received intelligence that Darius remained at Ecbatana, the capital of Media; upon which he pursued him with the greatest expedition, marching at the rate of nearly forty miles a day. In fifteen days he reached Ecbatana, where he was informed that Darius had retired from thence five days before, with an intent to pass into the remotest provinces of his empire. This put some stop to the rapid progress of the Macedonian army; and the king perceiving that there was no necessity for hurrying himself and his soldiers in such a manner, began to give the orders requisite in the present situation of his affairs. The Thessalian horse, who had deserved exceedingly well of him in all his battles, he dismissed according to his agreement; gave them their whole pay, and ordered two thousand talents over and above to be distributed amongst them. He then declared that he would force no man; but if any were willing to serve him longer for pay, he desired that they would enter their names in a book, which a great many of them did, whilst the rest sold their horses, and prepared for their departure. The king appointed Epocillus to conduct them to the sea, and assigned him a body of horse as an escort: he likewise sent Menetes with them, to take care of their embarkation, and see that they were safely landed in Eubœa, without any expense to themselves.

On receiving fresh information concerning the state of Darius's affairs, the king again set out in pursuit of him, advancing as far as Rhages, a city one day's journey from the Caspian Straits. There he understood that Darius had some time before passed those straits; and this information leaving him again without hopes, he halted for five days. Oxidates, a Persian whom Darius had left prisoner at Susa, was made governor of Media, whilst the king departed on an expedition into Parthia. The Caspian Straits he passed immediately without opposition, and then gave directions to his officers to collect a quantity of provisions sufficient to serve his army on a long march through a wasted country. But before his officers could accomplish these commands, the king received intelligence that Darius had been murdered by one of his own subjects, Bessus, the governor of Bactria.

As soon as Alexander had collected his forces together, and settled the government of Parthia, he entered Hyrcania; and having, according to his usual custom, committed the greater part of his army to the care of Craterus, he, at the head of a choice body of troops, passed through certain craggy roads, and, before the arrival of Craterus, who took an open and easy path, struck the whole provinces with such terror, that all the principal places were immediately put into his hands; and soon afterwards the province of Aria also submitted, and the king continued Satibarzanes the governor in his employment. The reduction of this province completed the conquest of Persia; but the ambition of Alexander to become master of every nation of which he had the least intelligence, induced him to enter the country of the Mardi, merely because its rocks and barrenness had hitherto prevented any one from conquering, or indeed from attempting to conquer it. This conquest, however, he easily accomplished, and obliged the whole nation to submit to his pleasure. But in the mean time disturbances began to arise in Alexander's new empire, and amongst his troops, which all his activity could not thoroughly suppress. He had scarcely left the province of Aria, when he received intelligence that the traitor Bessus had caused himself to be proclaimed king of Asia by the name of Artaxerxes; and that Satibarzanes had joined him, after having massacred all the Macedonians who had been left in the province. Alexander appointed one Arsames governor in the room of Satibarzanes, and marched thence with his army against the Zarangæ, who, under the command of Barzaentes, one of those who had conspired against Darius, had taken up arms, and threatened to make an obstinate defence. But their numbers daily decreasing, Barzaentes, afraid that they would purchase their own safety at the expense of his, privately withdrew from his camp, and, crossing the river Indus, sought shelter amongst the nations beyond it. But they, either dreading the power of Alexander, or detesting the treachery of this Persian towards his former master, seized and delivered him up to Alexander, who immediately caused him to be put to death.

The Macedonians give themselves up to pleasure.

The immense treasure which the Macedonians had acquired in the conquest of Persia now began to affect their discipline. The king himself was of a most generous disposition, and liberally bestowed his gifts on those around him; but they made a bad use of his bounty, and foolishly indulged in those vices by which the former possessors of that wealth had lost it. The king did all in his power to discourage the lazy and inactive pride which now began to show itself amongst his officers; but neither his discourses nor his example had any considerable effect. The manners of his courtiers from bad became worse, in spite of all he could say or do to prevent it; and at last they proceeded to censure his conduct, and to express themselves with some bitterness on the subject of his long continuance of the war, and his leading them constantly from one labour to another. This rose to such a height that the king was at last obliged to use some severity, in order to keep his army within the limits of their duty. From this time forward, however, Alexander himself began to alter his conduct, and, by yielding a little to the customs of the orientals, endeavoured to secure that obedience on the part of his new subjects which he found so difficult to preserve amongst his old ones. He likewise endeavoured, by various methods, to blend the customs of the Asiatics and the Greeks. The form of his civil government resembled that of the ancient Persian kings; in military affairs, however, he strictly preserved the Macedonian discipline; but then he made choice, out of the provinces, of thirty thousand boys, whom he caused to be instructed in the Greek language, and directed to be brought up in such a manner as that from time to time he might with them recruit the phalanx. The Macedonians observed with great concern these extraordinary measures, which suited very ill with their gross understandings; for, after all the victories they had gained, they expected to be absolute lords of Asia, and to possess not only the riches of its inhabitants, but to rule the inhabitants themselves; whereas they now found that Alexander meant no such thing, but that, on the contrary, he conferred governments, offices at court, and all other marks of confidence and favour, indiscriminately both on Greeks and Persians. From this time also the king seems to have given proofs of a cruelty which he had never shown before. Philotas, his most intimate friend, was seized, tortured, and put to death, for a conspiracy of which it could never be proved that he was guilty; and soon afterwards Parmenio and some others were executed without any crime at all, real or alleged. These things very much disturbed the army. Some of them wrote home to Macedonia respecting the king's suspicions of his friends, and his disposition to hunt out enemies at the very extremities of the world. Alexander having intercepted some of these letters, and procured the best information he could concerning their authors, picked out these dissatisfied people, and having disposed them into a corps, gave it the title of the "turbulent battalion;" hoping by this means to prevent the spirit of disaffection from pervading the whole army. As a further precaution against any future conspiracy, Alexander thought fit to appoint Hephæstion and Clytus generals of the auxiliary horse; being apprehensive, that if this authority was lodged in the hands of a single person, it might prompt him to dangerous undertakings, and at the same time furnish him with the means of carrying them into execution. To keep his forces in action, he suddenly marched into the country of the Euergetæ, or Benefactors, and found them full of the kind and hospitable disposition for which that name had been bestowed on their ancestors; he therefore treated them with great respect, and at his departure added some lands to their dominions, which lay contiguous, and which for that reason they had requested of him.

Satibarzanes defeated and killed.

Turning next to the east, he entered Arachosia, the inhabitants of which submitted without giving him any trouble. Whilst he passed the winter in these parts, the king received advice that the Arians, whom he had so lately subdued, were up again in arms, Satibarzanes having returned into that country with two thousand horse which had been assigned him by Bessus. Alexander instantly despatched Artabazus the Persian, with Erigyus and Caranus, two of his commanders, and a considerable body of horse and foot; he likewise ordered Phrataphernes, to whom he had given the government of Parthia, to accompany them. A general engagement ensued, in which the Arians behaved very well as long as their commander Satibarzanes lived; but he engaging Erigyus, the Macedonian struck him first in the throat, and then, drawing forth his spear again, through the mouth, so that he immediately expired, and with him the courage of his soldiers, who instantly began to fly; whereupon Alexander's commanders made an easy conquest of the rest of the country, and effectually reduced it under his obedience.

The king, notwithstanding the inclemency of the season, advanced into the country of Paropamisus, so called from the mountain Paropamisus, which the soldiers of Alexander called Caucasus. Having crossed the country in sixteen days, he came at length to an opening leading into Media; and finding it of a sufficient breadth, he directed a city to be built there, which he called Alexandria, as also several other towns about a day's journey distant from thence; and in these places he left seven thousand persons, part of them such as had hitherto followed his camp, and part of the mercenary soldiers, who, weary of continual fatigue, were content to dwell there. Having thus settled things in this province, sacrificed solemnly to the gods, and appointed Proexes the Persian president thereof, with a small body of troops under the command of Niloxenus to assist him, he resumed his former design of penetrating into Bactria.

Bessus reduced and put to death.

Bessus, who had assumed the name of Artaxerxes, when he was assured that Alexander was marching towards him, immediately began to waste all the country between Paropamisus and the river Oxus, which river he passed with all his forces, and then burned all the vessels he had made use of for transporting them, retiring to Nautaca, a city of Sogdia; fully persuaded that, by the precautions he had taken, Alexander would be compelled to give over his pursuit. This conduct of his, however, disheartened his troops, and gave the lie to all his pretensions; for he had affected to censure Darius's conduct, and had charged him with cowardice, in not defending the rivers Euphrates and Tigris, whereas he now quitted the banks of the most defensible river perhaps in the whole world. As to his hopes, though it cannot be said they were ill founded, yet they proved absolutely vain; for Alexander, continuing his march, notwithstanding the hardships his soldiers sustained, reduced all Bactria under his obedience, particularly the capital Bactria and the strong castle Aornus. In the latter he placed a garrison under the command of Archelaus, but the government of the province he committed to Artabazus. He then continued his march to the river Oxus, on the banks of which when he arrived, he found it three quarters of a mile in breadth, its depth more than proportional to its breadth, its bottom sandy, its stream so rapid as to render it almost unnavigable, and neither boat nor tree in its neighbourhood; so that the ablest commanders in the Macedonian army were of opinion that the army would be obliged to march back. The king, however, having first sent away, under a proper escort, all his infirm and worn-out soldiers, that they might be conducted safely to the sea-ports, and thence transported to Greece, devised a method of passing this river without either boat or bridge, by causing the hides which covered the soldiers' tents and carriages to be stuffed with straw, and then tied together, and thrown into the river. Having crossed the Oxus, he marched directly towards the camp of Bessus, where, when he arrived, he found it abandoned; but at the same time received letters from Spitamenes and Dataphernes, who were the chief commanders under Bessus, signifying, that if he would send a small party to receive Bessus, they would deliver him into his hands; which they did accordingly, and the traitor was immediately put to death.

Alexander passes the Indus.

A supply of horses having now arrived, the Macedonian cavalry were remounted. Alexander continued his march to Maracanda, the capital of Sogdia, whence he advanced to the river Iaxartes. Here he performed extraordinary exploits against the Scythians, from whom, however, though he overcame them, his army suffered much; and the revolted Sogdians, being headed by Spitamenes, gave him a great deal of trouble. Here also he married Roxana the daughter of Oxyartes, a prince of the country whom he had subdued. But during these expeditions, the king greatly disgusted his army by the murder of his friend Clytus in a drunken quarrel at a banquet, and by his extravagant vanity in claiming divine honours. At last he arrived at the river Indus, where Hephæstion and Perdiccas had already provided a bridge of boats for the passage of that river. The king refreshed his troops for thirty days in the countries on the other side of the river, which were those of his friend and ally Taxiles, who gave him thirty elephants, and joined his army with about seven hundred Indian horse, to which, when they were to enter upon action, he afterwards added five thousand foot. The true reason of this seems to have been his enmity to Porus, an Indian prince whose territories were situated on the other side of the river Hydaspes. During this recess, the king sacrificed with great solemnity; receiving also ambassadors from Ambisurus, a very potent prince, and from Doxareas, who was likewise a king in those parts, with tenders of their duty, and considerable presents. When these ceremonies were ended, Alexander appointed Philip governor of Taxila, and put a Macedonian garrison into the place, because he intended to erect an hospital there for the cure of his sick and wounded soldiers. He then ordered the vessels of which his bridge had been composed when he passed the Indus to be taken to pieces, that they might be brought to the Hydaspes, where he was informed that Porus with a great army lay encamped to dispute his passage. When he approached the banks of this river with his army, and the auxiliaries under the command of Taxiles, he found that the people he had to do with were not so easily to be subdued as the Persians and other Asiatics. The Indians were not only a very tall and robust, but also a very hardy and well-disciplined people; and their king Porus was a prince of high spirit, invincible courage, and superior ability.

Passage of the Hydaspes with difficulty.

It was about the summer solstice when Alexander reached the Hydaspes, and consequently its waters were broader, deeper, and more rapid, than at any other time; for in India the rivers swell as the sun's increasing heat melts the snow, and subside again as winter approaches. Alexander therefore had every difficulty to struggle with. Porus had made his dispositions so judiciously, that Alexander found it impossible to practise upon him as he had done upon others, and to pass the river in his view; wherefore he was constrained to divide his army into small parties, and to employ other arts, in order to get the better of so vigilant a prince. To this end he caused a great quantity of corn and other provisions to be brought into his camp, giving out that he intended to remain where he was till the river should subside, and, by becoming fordable, afford him an opportunity of forcing a passage. This did not, however, prevent Porus from keeping up very strict discipline in his camp; which Alexander perceiving, frequently made such motions as seemed to indicate a change of his resolution, and that he had still thoughts of passing the river. The main thing the Macedonians stood in fear of were the elephants; for the bank being pretty steep on the other side, and it being the nature of horses to start at the first appearance of these animals, it was foreseen that the army would be disordered, and incapable of sustaining the charge of Porus's troops. At length Alexander passed the river by the following contrivance. At the distance of a hundred and fifty stadia from his camp there was a rocky promontory projecting into the river, thickly covered with wood; and over against this promontory there lay a pretty large uninhabited island, almost overgrown with trees. The king therefore conceived within himself a project of conveying a body of troops from this promontory into that island; and upon this scheme he built his hopes of surprising Porus, vigilant as he was. To this end he kept him and his army constantly alarmed for many nights together, till he perceived that Porus apprehended that it was only done to harass his troops, and therefore no longer drew out of his camp, but trusted to his ordinary guards; then Alexander resolved to put his design in execution. A considerable body of horse, the Macedonian phalanx, with some corps of light-armed foot, he left in his camp under the command of Craterus, as also the auxiliary Indians, giving orders that if Porus marched against him with part of his army, and left another part with the elephants behind in his camp, Craterus and his forces should remain where they were; but if it so happened that Porus withdrew his elephants, then Craterus was to pass the river, because his cavalry might then do so with safety. Alexander having marched half the way, or about nine of our miles, ordered the mercenary troops under the command of Attalus and other generals to remain there, and directed them, that as soon as they knew he was engaged with the Indians on the other side, they should pass in vessels provided for that purpose, in order to assist him. Then marching a long way about, that the enemy might not perceive his design of reaching the rock, he advanced as diligently as he could towards that post. It happened very fortunately for him, that a great storm of thunder, lightning, and hail, rose in the night, whereby his march was perfectly concealed, his vessels of thirty oars put together, and his tents stuffed and stitched, so that they passed from the rock into the island without being perceived, a little before break of day, the storm ceasing just as he and his soldiers were ready for their passage. When they had traversed the island, they boldly set forward to gain the opposite shore in sight of Porus's outposts, who instantly hastened to give their master an account of the attempt. Alexander landed first himself, and was followed as expeditiously as possible by his forces, whom he took care to draw up as fast as they arrived. When they began their march again, they found that their good fortune was not so great as they at first esteemed it; for it appeared now that they had not reached the continent at all, but were in truth in another island much larger than the former. They crossed it as fast as they could, and found that it was divided from the *terra firma* by a narrow channel, which, however, was so swelled by the late heavy rain, that the poor soldiers were obliged to wade up to the breast. When they were on the other side, the king drew them up again carefully, ordering the foot, in number about six thousand, to march slowly, whilst himself, with five thousand horse, led the advance. As soon as Porus received intelligence that Alexander was actually passing the river, he sent his son with two thousand horse and a hundred and twenty armed chariots to oppose him. But they came too late; Alexander had already reached the shore, and begun his march.

When the Macedonian scouts perceived them advance, they informed the king, who sent a detachment to attack them, remaining still at the head of his cavalry in expectation of Porus. But when he found that this party was unsupported, he instantly attacked with all his horse, and defeated them with the slaughter of many, and the loss of all their armed chariots, the son of Porus being slain in the fight. The remainder of the horse returning to the camp with this disastrous account, Porus was in some confusion; he however quickly adopted the best and wisest resolutions which circumstances would allow, namely, to leave a part of his army, with some of his elephants, to oppose Craterus, who was now about to pass the river also, and with the remainder to march against Alexander and his forces, who were already passed. This resolution once taken, he marched immediately out of his camp at the head of four thousand horse, thirty thousand foot, three hundred chariots, and two hundred elephants. He advanced as expeditiously as he could, till he came into a plain which was firm and sandy, where his chariots and elephants might act to advantage; and there he halted, that he might put his army in order, knowing well that he need not go in quest of his enemy. Alexander soon came up with his horse, but he did not charge Porus; on the contrary, he halted, and put his troops in order, that they might be able to defend themselves in case they were attacked. When he had waited some time, his foot arrived, and he immediately surrounded them with his horse, that, after so fatiguing a march, they might have time to cool and breathe a little before they were led to engage. Porus permitted all this, because it was not his interest to fight, and because he depended chiefly upon his order of battle, the elephants covering his foot, so that the Macedonians could not charge them.

Porus himself defeated.

When Alexander had disposed his foot in proper order, he placed his horse on the wings; and, observing that he was much superior in that arm to the enemy, and that the cavalry of Porus were easy to be charged, he resolved to let the foot have as little share as possible in the battle. To this end, having given the necessary directions to Cœnus, who commanded them, he went himself to the right, and fell with great fury upon the left wing of Porus. The dispute, though short, was very bloody. The cavalry of Porus, though they fought gallantly, were quickly broken; and the foot being by this means uncovered, the Macedonians charged them. The Indian horse rallying, came up to their relief; but they were again defeated. By this time the archers had wounded many of the elephants, and killed most of their riders, so that they did not prove less troublesome and dangerous to their own side than to the Macedonians; whence a great confusion ensued, and Cœnus, taking this opportunity, fell on with the troops under his command, and entirely defeated the Indian army. Porus himself behaved with the greatest intrepidity, and with the most excellent conduct; he gave his orders, and directed every thing, as long as his troops retained their formation; and when they were broken, he retired from party to party as they made stands, and continued fighting till every corps of Indians was put to the route. In the mean time Craterus had passed with the rest of the Macedonian army; and these, falling upon the flying Indians, increased the slaughter of the day excessively, insomuch that twenty thousand foot and three thousand horse were killed, all the chariots were hacked to pieces, and the elephants not killed were taken; two of Porus's sons fell here, as also most of his officers of all ranks.

As for Porus, Alexander gave strict directions that no injury might be done to his person. He even sent Taxiles to persuade him to surrender himself, and to assure him that he should be treated with all the kindness and respect imaginable; but Porus, disdaining this advice from the mouth of an old enemy, threw a javelin, which would have killed him, but for the quick turn of his horse. Meroe the Indian, who was in the service of Alexander, succeeded better. He had been the old acquaintance of Porus, and therefore when he entreated that prince to spare his person, and to submit himself to fortune and a generous victor, Porus followed his advice; and we may truly say, that the condition of this Indian king suffered nothing by the loss of the battle. Alexander immediately gave him his liberty, and shortly afterwards restored him to his kingdom, to which he annexed provinces almost equal to it in value. Neither was Alexander a loser by his munificence, for Porus remained his true friend and constant ally. To perpetuate the memory of this victory, Alexander ordered two cities to be erected; one on the field of battle, which he named Nicæa; the other on the opposite side of the river, which he called Bucephala, in honour of his horse Bucephalus, who died here, as Arrian says, of mere old age, being on the verge of thirty. All the soldiers who fell in the battle he buried with great honours, offered solemn sacrifices to the gods, and exhibited pompous shows on the banks of the Hydaspes, where he had forced his passage. He then entered the territories of the Glausæ, in which were thirty-seven good cities, and a multitude of populous villages. All these were delivered up to him without fighting; and as soon as he received them, he presented them to Porus, and having reconciled him to Taxiles, he sent the latter home to his own dominions. About this time ambassadors arrived from several Indian princes with their submissions; and Alexander having conquered the dominions of another Porus, which lay on the Hydraotes, a branch of the Indus, added them to those of Porus his ally.

Sangala taken and razed.

In the middle of all this success, however, news arrived that the Cathei, Oxydracæ, and the Malli, the most warlike nations of India, were confederated against the Macedonians, and had drawn together a great army. The king immediately marched to give them battle, and in a few days reached a city called Sangala, seated on the top of a hill, and having a fine lake behind it. Before this city the confederate Indians lay encamped, having three circular lines of carriages locked together, and their tents pitched in the centre. Notwithstanding the apparent difficulty of forcing these intrenchments, Alexander resolved immediately to attack them. The Indians made a noble defence; but at last the first line of their carriages was broken, and the Macedonians entered. The second was stronger by far; yet Alexander attacked that too, and after a desperate resistance forced it. The Indians, without trusting to the third, retired into the city, which Alexander would have invested; but the foot he had with him not being sufficient for that purpose, he caused his works to be carried on both sides as far as the lake; and, on the other side of that, ordered several brigades of horse to take post, ordering also battering engines to be brought up, and in some places employing miners. The second night, he received intelligence that the besieged, knowing the lake to be fordable, intended to make their escape through it. Upon this the king ordered all the carriages which had been taken in forcing their camp, to be placed up and down the roads, in hopes of preventing their flight; giving directions to Ptolemy, who commanded the horse on the other side of the lake, to be extremely vigilant, and to cause all his trumpets to sound, that the forces might repair to that post where the Indians made their greatest effort. These precautions had all the effect that could be desired; for of the few Indians who got through the lake, and passed the Macedonian horse, the greater part were killed on the roads; but the greatest part of their army was constrained to retire again through the water into the city. Two days after, the place was taken by storm. Seventeen thousand Indians were killed, and seventy thousand taken prisoners, with three hundred chariots, and five hundred horse. The Macedonians are said to have lost only a hundred men in this siege; but they had twelve hundred wounded, and amongst these several persons of great distinction. The city was no sooner taken, than Alexander despatched Eumenes his secretary, with a party of horse, to acquaint the inhabitants of the cities adjacent with what had befallen the Sangalans; promising also, that they should be kindly treated if they would submit. But they were so much affrighted at what had happened to their neighbours, that, abandoning all their cities, they fled into the mountains; choosing rather to expose themselves to wild beasts than to these invaders, who had treated their countrymen so cruelly. When the king was informed of this, he sent detachments of horse and foot to scour all the roads; and these, finding aged, infirm, and wounded people, to the number of about five hundred, put them to the sword without mercy. Perceiving that it was impossible to persuade the inhabitants to return, he caused the city of Sangala to be razed, and gave the territories to the few Indians who had submitted to him.

The troops refuse to proceed farther.

Alexander, still unsated with conquest, now prepared to pass the Hyphasis. The chief reason which induced him to think of this expedition, was the information he had received of the state of the countries beyond that river. He was told that they were in themselves rich and fruitful; that their inhabitants were not only a very martial people, but very civilized; that they were governed by the nobility, who were themselves subject to the laws; and that as they lived in happiness and freedom, it was likely they would fight obstinately in defence of those blessings. He was further told, that amongst these nations there were the largest, strongest, and most useful elephants bred and tamed; and was therefore fired with an earnest desire of reducing such a bold and brave people under his rule, and of attaining to the possession of the many valuable things that were said to be amongst them. As exorbitant, however, as his personal ambition was, he found it impossible to infuse any part of it into the minds of his soldiers, who were so far from wishing to triumph over new and remote countries, that they were highly desirous of leaving those that they had already conquered. When therefore they were informed of the king's intentions, they privately consulted together in the camp about the situation of their own affairs. At this consultation, the gravest and best of the soldiers lamented that they were made use of by their king, not as lions, who fall fiercely upon those who have injured them, but as mastiffs, who fly upon and tear those who are pointed out to them as enemies. The rest were not so modest, but expressed themselves roundly against the king's humour for leading them from battle to battle, from siege to siege, and from river to river; protesting that they would follow him no farther, nor lavish their blood any longer, to purchase for him the fame he coveted. Alexander had too much penetration not to perceive that his troops were very uneasy. He therefore harangued them from his tribunal; but though his eloquence was great, and the love his army had for him was yet very strong, they did not relent. For some time the soldiers remained sullen and silent; and at last turned their eyes on Cœnus, an old and experienced general, whom Alexander loved, and in whom the army put great confidence. He had the generosity to undertake their cause, and told Alexander frankly, "that men endured toil in hopes of repose; that the Macedonians were already much reduced in their numbers; that of those who remained, the greater part were invalids; and that they expected, in consideration of their former services, that he would now lead them back to their native country; an act which, of all others, would most contribute to his own great designs, since it would encourage the youth of Macedonia, and even of all Greece, to follow him in whatever new expedition he pleased to undertake." The king was far from being pleased with this speech of Cœnus, and much less with the disposition of his army, which continued in a deep silence. He therefore dismissed the assembly. But next day he called another, in which he told the soldiers plainly, that he would not be driven from his purpose; that he would proceed in his conquests with such as should follow him voluntarily; and that, as for the rest, he would not detain them, but would leave them at liberty to go home to Macedonia, where they might publish, "that they had left their king in the midst of his enemies." Even this expedient had no success; his army was so thoroughly tired with long marches and desperate battles, that they were determined to advance no further; upon which Alexander retired to his tent, where he refused to see his friends, and evinced the same gloomy temper that reigned amongst his troops.

For three days things remained in this situation. At last the king suddenly appeared; and, as if he had been fully determined to pursue his first design, he gave orders to sacrifice for the good success of his new undertaking. But Aristander the augur reported that the omens were altogether inauspicious; upon which the king said, that since his proceeding farther was neither pleasing to the gods nor grateful to his army, he would return. When this was rumoured amongst the army, they assembled in great numbers about the royal tent, saluting the king with loud acclamations; wishing him success in all his future designs, and giving him at the same time hearty thanks, inasmuch as "he who was invincible had suffered himself to be overcome by their prayers." A stop being thus put to the conquests of Alexander, he determined to make the Hyphasis the boundary of his dominions; and having erected twelve altars of an extraordinary magnitude, he sacrificed upon them, after which he exhibited shows in the Grecian manner; and, having added all the conquered country in these parts to the dominions of Porus, he began to return. Having arrived at the Hydaspes, he made the necessary preparations for sailing down the Indus to the ocean. For this purpose, he ordered vast quantities of timber to be felled in the neighbourhood of the Hydaspes, through which he was to sail into the Indus; and he caused the vessels with which he had passed other rivers to be brought thither, and assembled a vast number of artificers capable of repairing and equipping his fleet, which, when finished, consisted of eighty vessels of three banks of oars, and two thousand lesser ships and transports. Those who were to manage this fleet were collected from among the Phœnicians, Cyprians, Carians, and Egyptians who had followed his army, and were reckoned perfectly well skilled in the nautical art. When all things were ready, the army embarked about break of day; whilst the king, in the mean time, sacrificed to the gods, according to the ceremonies used in his own country, and likewise according to those of the country in which he now was. Then he himself went on board, and causing the signal to be given by sound of trumpet, the fleet set sail. Craterus and Hephæstion had marched some days before with another division of the army; and in three days the fleet reached that part of the river which was opposite to their camps. Here he received information that the Oxydracæ and Malli were raising forces to oppose him, upon which he immediately determined to reduce them; for, during this voyage, he made it a rule to compel the inhabitants on both sides of the river to yield him obedience. But before he arrived amongst the people above mentioned, he himself sustained no small danger; for, coming to the confluence of the Acesines with the Hydaspes, whence both rivers roll together into the Indus, the eddies, whirlpools, and rapid currents, rushing with tremendous noise from the respective channels of those rivers into the great one formed by them both, at once terrified those who navigated his vessels, and actually destroyed many of the long vessels, with all who were on board of them; the king himself being in some danger, and Nearchus the admiral not a little at a loss. As soon as this danger was over, Alexander went on shore; and having ordered his elephants with some troops of horse and archers to be carried across, and put under the command of Craterus, he then divided his army on the left-hand bank into three bodies, the first commanded by himself, the second by Hephæstion, and the third by Ptolemy. Hephæstion had orders to move silently through the heart of the country, five days' march before the king; that if, on Alexander's approach, any of the barbarians should attempt to shelter themselves by retiring into the country, they might fall into the hands of Hephæstion. Ptolemy Lagus was ordered to march three days' journey behind the king, that if any escaped his army, they might fall into Ptolemy's hands; and the fleet had orders to stop at the confluence of this river with the Hydraotes until such time as all these several corps should arrive.

His expedition against the Malli.

Alexander himself, at the head of a body of horse and light-armed foot, marched through a desert country against the Malli, and, scarcely affording any rest to his soldiers, arrived in three days at a city into which the barbarians had put their wives and children, with a good garrison for their defence. The country people, having no notion that Alexander would march through such a desert and barren region, were all unarmed, and in the utmost confusion. Many of them therefore were slain in the fields; the rest fled into the city, and shut the gates. But this only protracted their fate for a short time; for the king, having ordered the city to be invested by his cavalry, took it, as well as the castle, by storm, and put all he found there to the sword. He sent at the same time Perdiccas, with a considerable detachment, to invest another city of the Malli, at a considerable distance; but when he came there he found it abandoned. However, he pursued the inhabitants, who had but lately left it, and killed great numbers of them on the road. After this the king took several other cities, but not without considerable resistance; for the Indians sometimes chose to burn themselves in their houses rather than surrender. At last he marched to their capital city; and finding it abandoned, he proceeded to the river Hydraotes, where he found fifty thousand men encamped on the opposite bank, in order to dispute his passage. He did not hesitate, however, to enter the river with a considerable party of horse; and so much were the Indians terrified at his presence, that their whole army retired before him. In a short time they returned and attacked him, being ashamed to fly before such an inconsiderable number; but in the mean time the rest of the Macedonian forces came up, and the Indians were obliged to retire to a city which lay behind them, and which Alexander invested that very night. The next day he stormed the city with such violence, that the inhabitants were compelled to abandon it, and to retire to the castle, where they prepared for an obstinate defence. The king instantly gave orders for scaling the walls, and the soldiers prepared to execute these orders as fast as they could; but the king being impatient, caught hold of a ladder and mounted it first himself, being followed by Leonatus, Peucestas, and Abreas, the latter a man of great valour, and who on that account had double pay allowed him. The king having gained the top of the battlements, cleared them quickly of the defendants, killing some of them with his sword, and pushing others over the walls; but after this was done, he was in more danger than ever, for the Indians galled him with their arrows from the adjacent towers, though they durst not approach near enough to engage him. His own battalion of targeteers mounting in haste to second him, broke the ladders; which, as soon as Alexander perceived, he threw himself down into the castle, as did also Peucestas, Leonatus, and Abreas. As soon as the king was on the ground, the Indian general rushed forward to attack him; but Alexander instantly despatched him, as well as several others who followed him. Upon this the rest retired, and contented themselves with throwing darts and stones at him at a distance. Abreas was struck in the head with an arrow, and died on the spot; and, shortly after, another pierced through the king's breast-plate into his body. As long as he had spirits, he defended himself valiantly; but, through a vast effusion of blood, losing his senses, he fell upon his shield. Peucestas then covered him with the sacred shield of Pallas on one side, as did Leonatus with his own shield on the other, though they themselves were dreadfully wounded. In the mean time, however, the soldiers on the outside, eager to save their king, supplied their want of ladders by driving large iron pins into the walls. By the help of these many of them ascended, and came to the assistance of Alexander and his companions. The Indians were now slaughtered without mercy; but Alexander continued for some time in a very dangerous way. However, he at last recovered his strength, and showed himself again to his army, which filled them with the greatest joy.

Continues his voyage down the Indus.

The Malli, being now convinced that nothing but submission could save the remainder of them, sent deputies to Alexander, offering the dominion of their country, as did also the Oxydracæ; and the king having settled every thing in these countries agreeable to his mind, proceeded on his voyage down the river Indus. In this voyage he received the submission of some other Indian princes; and perceiving, that at the point of the island Pattala, the river divided itself into two vast branches, he ordered an haven and convenient docks to be made there for his ships; and when he had careened his fleet, he sailed down the right-hand branch towards the ocean. In his passage he sustained great difficulties by reason of the want of pilots, and at the mouth of the river very narrowly missed being cast away; yet all this did not prevent him from pursuing his first design, though it does not appear that he had any other motive thereto than the vain desire of boasting that he had entered the ocean beyond the Indus; for, having consecrated certain bulls to Neptune, and thrown them into the sea, performed certain libations out of golden cups, and thrown the cups also into the sea, he came back again, having only surveyed two little islands, one at the mouth of the Indus, and one a little farther in the ocean. On the king's return to Pattala, he resolved to sail down the other branch of the Indus, that he might see whether it was more safe and commodious for his fleet than that which he had already tried; and for this he had very good reasons. He had resolved to send Nearchus with his fleet by sea, through the Persian Gulf, up the river Tigris, to meet him and his army in Mesopotamia; but as the possibility of this voyage depended on the ceasing of the etesian winds, there was a necessity for laying up the fleet till the season should prove favourable. Alexander, therefore, sailing through this branch of the Indus, sought on the sea-coast for bays and creeks, where his fleet might anchor in safety; he also caused pits to be sunk, which might be filled with fresh water for the use of his people, and took all imaginable precautions for preserving them in ease and safety till the season would allow them to continue their voyage. In this he succeeded to his wish; for he found this branch of the river Indus, at its mouth, spread over the plain country, and forming a kind of lake, in which a fleet might ride with safety. He therefore appointed Leonatus, and a part of his army, to carry on such works as were necessary, causing them to be relieved by fresh troops as often as there was occasion; then having given his last instructions to Nearchus, he departed with the rest of the army, in order to march back to Babylon.

His march through Gedrosia.

Before the king's departure, many of his friends advised him against the route which he intended to take. They told him, that nothing could be more rash or dangerous than this resolution. They informed him, that the country through which he was to travel was a wild uncultivated desert; that Semiramis, when she led her soldiers this way out of India, brought home but twenty of them; and that Cyrus, attempting to do the same, returned with only seven. But all this was so far from deterring Alexander, that it more than ever determined him to pursue no other route. As soon, therefore, as he had put things in order, he marched at the head of a sufficient body of troops to reduce the Oritæ, who had never vouchsafed either to make their submission or to court his friendship. Their territories lay upon the other side of a river called Arabis, which Alexander crossed so speedily, that they had no intelligence of his march; whereupon most of them quitted their country, and fled into the deserts. Their capital he found so well situated, that he resolved to take it out of their hands, and to cause a new and noble city to be founded there, the care of which he committed to Hephæstion. Then he received the deputies of the Oritæ and Gedrosi; and having assured them, that if the people returned to their villages, they should be kindly treated, and having appointed Apollophenes president of the Oritæ, and left a considerable body of troops under Leonatus to secure their obedience, he began his march through Gedrosia. In this march his troops suffered incredible hardships. The road was very uncertain and troublesome, on account of its lying through deep and loose sands, rising in many places into hillocks, which forced the soldiers to climb, at the same time that it sunk under their feet; there were no towns, villages, nor places of refreshment, to be met with; so that, after excessive marches, they were forced to encamp among these dry sands. As to provisions, they hardly met with any during their whole march. The soldiers were therefore obliged to kill their beasts of carriage; and such as were sent to bring some corn from the sea side, were so grievously distressed, that, though it was sealed with the king's signet, they cut open the bags, choosing rather to die a violent death for disobedience than perish by hunger. When the king, however, was informed of this, he freely pardoned the offenders; he was also forced to accept the excuses that were daily made for the loss of mules, horses, &c. which were in truth eaten by the soldiers, and their carriages broken in pieces to avoid further trouble. As for water, their want of it was a great misfortune, and yet their finding it in plenty was sometimes a greater; for, as in the one case they perished with thirst, so in the other they were thrown into dropsies, and rendered incapable of travel. Frequently they met with no water for the whole day together; sometimes they were disappointed of it at night, in which case, if they were able, they marched on; so that it was common with them to travel thirty, forty, fifty, or even sixty miles without encamping. Through these hardships numbers were obliged to fall into the rear; and of these many were left behind, and perished; for indeed scarcely any of them ever joined the army again. Their miseries, however, they sustained with incredible patience, being encouraged by the example of their king, who, on this occasion, suffered greater hardships than the meanest soldier in his army.

Arrival in Caramania.

At last they arrived at the capital of Gedrosia, where they refreshed themselves, and staid some time; after which they marched into Caramania, which being a very plentiful country, made them ample amends for the hardships and fatigues which they had sustained. Here they were joined, first by Craterus with the troops under his command, along with a number of elephants; then came Stasanor, president of the Arians, and Pharismanes, the son of Phrataphernes, the governor of Parthia. They brought with them camels, horses, and other beasts of burden, in vast numbers; having foreseen that the king's march through Gedrosia would be attended with the loss of the greater part, if not all, of the cavalry and beasts belonging to his army. During Alexander's stay in Caramania, he redressed the injuries of his people, who had been grievously oppressed by their governors during his absence. Here also he was joined by his admiral Nearchus, who brought with him an account that all under his command were in perfect safety, and in excellent condition; intelligence with which the king was mightily pleased, and, after having bestowed on him singular marks of his favour, sent him back to the navy. Alexander next set out for Persia, where great disorders had been committed during his absence. These he also redressed, and caused the governor to be crucified; appointing in his room Peucestas, who had saved his life when he fought singly against a whole garrison, as above related. The new governor was no sooner invested with his dignity than he laid aside the Macedonian garb, and put on that of the Medes, being the only one of Alexander's captains who, by complying with the manners of the people he governed, gained their affection.

Whilst Alexander visited the different parts of Persia, he took a view, amongst the rest, of the ruins of Persepolis, where he is said to have expressed great sorrow for the destruction he had formerly occasioned. From Persepolis he marched to Susa, where he gave an extraordinary loose to pleasure, resolving to make himself and his followers some amends for the difficulties which they had hitherto undergone, purposing at the same time so effectually to unite his newly-conquered with his hereditary subjects, that the jealousies and fears which had hitherto tormented both should no longer subsist. With this view he married two wives of the blood royal of Persia; Barsine or Statira, the daughter of Darius, and Parysatis, the daughter of Ochus. Drypetis, another daughter of Darius, he gave to Hephæstion; Amastrine, the daughter of Oxyartes, the brother of Darius, married Craterus; and to the rest of his friends, to the number of eighty, he gave other women of the highest quality. All these marriages were celebrated at once, Alexander himself bestowing fortunes upon them. He likewise directed that an account should be taken of the number of his officers and soldiers who had married Asiatic wives; and though they appeared to be ten thousand, yet he gratified each of them according to his rank. He next resolved to pay the debts of his army, and thereupon issued an edict directing every man to register his name, and the sum he owed; an order with which the soldiers complying slowly, from an apprehension that there was some design against them, Alexander ordered tables heaped with money to be set in all quarters of the camp, and caused every man's debts to be paid on his bare word, without even making any entry of his name, though the whole sum amounted to twenty thousand talents. On such as had distinguished themselves in an extraordinary manner he bestowed crowns of gold. Peucestas received the first, Leonatus the second, Nearchus the third, Onecritus the fourth, Hephæstion the fifth, and the rest of his guards had each of them one. After this he made other dispositions for conciliating, as he supposed, the differences amongst his subjects. He reviewed the thirty thousand youths whom at his departure for India he had ordered to be taught Greek and the Macedonian discipline, expressing high satisfaction at the fine appearance they made, which rendered them worthy of the appellation he bestowed on them, that of *Epigoni*, or successors. He promoted also, without any distinction of nation, all those who had served him faithfully and valiantly in the Indian war. When all these regulations were made, he gave the command of his heavy-armed troops to Hephæstion, and ordered him to march directly to the banks of the Tigris; whilst in the mean time a fleet was equipped for carrying the king and the troops which he retained with him down to the ocean.

His death and character.

Thus ended the exploits of Alexander, the greatest conqueror that ever the world saw, at least with respect to the rapidity of his conquests. In the course of twelve years he had brought under his subjection Egypt, Libya, Asia Minor, Syria, Phœnicia, Palestine, Babylonia, Persia, with part of India and Tartary. Still, however, he meditated greater things. He had now got a great taste for maritime affairs, and is said to have meditated a voyage to the coasts of Arabia and Ethiopia, and thence round the whole continent of Africa to the Straits of Gibraltar. But of this there is no great certainty, though that he intended to subdue the Carthaginians and Italians is more than probable. All these designs, however, were frustrated by his death, which happened at Babylon, in the year 323 before Christ. He is said to have received several warnings of his approaching fate, and to have been advised to avoid that city, which advice he either despised or could not follow. He died of a fever, after eight days' illness, without naming any successor; having only given his ring to Perdiccas, and left the kingdom, as he said, "to the most worthy."

The character of this great prince has been variously represented; but most historians seem to have looked upon him rather as an illustrious madman than one upon whom the epithet of Great could be properly bestowed. From a careful observation of his conduct, however, it must appear that he possessed not only a capacity to plan, but likewise to execute, the greatest enterprises which ever entered into the mind of any of the human race. From whatever cause the notion originated, it is plain that he imagined himself a divine person, and born to subdue the whole world; and extravagant and impracticable as this scheme may appear at present, it cannot at all be looked upon in the same light in the age of Alexander. The Greeks were in his time the most powerful people in the world in respect to their skill in the military art, and the Persians were the most powerful with respect to wealth and numbers. The only other powerful nations in the world were the Carthaginians, Gauls, and Italian nations. From a long series of wars which the Carthaginians carried on in Sicily, it appeared that they were by no means capable of contending with the Greeks, even when they had an immense superiority of numbers; and much less could they have sustained an attack from the whole power of Greece and Asia united. The Gauls and Italians were indeed very brave, and of a martial disposition; but they were barbarous, and could not have resisted armies well disciplined, and under the command of such a skilful leader as Alexander. Even long after this time, it appeared that the Romans themselves could not have resisted the Greeks, since Regulus, after having defeated the Carthaginians, and reduced them to the utmost distress, was totally unable to resist a Carthaginian army commanded by a Greek general, and trained to Greek discipline.

Thus it appears that the scheme of Alexander cannot by any means be accounted that of a madman, or of one who projects great things without judgment, and the means necessary to execute them. If from his actions we consider the end which he most probably had in view could his scheme have been accomplished, we shall find it not only the greatest, but the best, which can possibly be imagined. He did not conquer to destroy, enslave, or oppress, but to civilize and to unite the whole world as one nation. No sooner was a province conquered than he took care of it as if it had been part of his paternal inheritance. He allowed not his soldiers to oppress and plunder the Persians, which they were very much inclined to do; on the contrary, by giving in to the oriental customs himself, he strove to extinguish that inveterate hatred which had so long subsisted between the two nations. In the Scythian countries which he subdued he pursued the same excellent plan. His courage and military skill, in which he never was excelled, were displayed, not with a view to rapine or desultory conquest, but to civilize and induce the barbarous inhabitants to employ themselves in a more proper way of life. Amidst the hardships of a military life, obstinate sieges, bloody battles, and dear-bought victories, he still respected the rights of mankind, and practised the mild virtues of humanity. The conquered nations enjoyed their ancient laws and privileges; the rigours of despotism were softened; arts and industry encouraged; and the proudest Macedonian governors compelled, by the authority and example of Alexander, to observe the rules of justice towards their meanest subjects. To bridle the fierce inhabitants of the Scythian plains, he founded cities and established colonies on the banks of the Iaxartes and Oxus; and those destructive campaigns usually ascribed to his restless activity and blind ambition appeared to the discernment of this extraordinary man, not only essential to the security of the conquests which he had already made, but necessary for the more remote and splendid expeditions which he still purposed to undertake, and which he performed with singular boldness and unexampled success.

He was of a low stature, and somewhat deformed; but the activity and elevation of his mind animated and ennobled his frame. By a life of continual labour, and by an early and habitual practice of the gymnastic exercises, he had hardened his body against the impressions of cold and heat, hunger and thirst, and prepared his robust constitution for bearing such exertions of strength and activity, as have appeared incredible to the undisciplined softness of modern times. In generosity and in prowess he rivalled the greatest heroes of antiquity; and in the race of glory, having finally outstripped all competitors, became ambitious to surpass himself. His superior skill in war gave uninterrupted success to his arms; and his natural humanity, enlightened by the philosophy of Greece, taught him to improve his conquests to the best interests of mankind. In his extensive dominions he built or founded not less than seventy cities; the situation of which, being chosen with consummate wisdom, tended to facilitate communication, to promote commerce, and to diffuse civilization through the greatest nations of the earth. It may be suspected, indeed, that he mistook the extent of human power, when in the course of one reign he undertook to change the face of the world; and that he miscalculated the stubbornness of ignorance and the force of habit, when he attempted to enlighten barbarism, to soften servitude, and to transplant the improvements of Greece into an African and Asiatic soil, where they have never been known to flourish. Yet let not the designs of Alexander be too hastily accused of extravagance. Whoever seriously considers what he actually performed before his thirty-third year, will be cautious of determining what he might have accomplished had he reached the ordinary term of human life. His resources were peculiar to himself; and such views as well as actions became him, as would have become none besides. In the language of a philosophical historian, "he seems to have been given to the world by a peculiar dispensation of Providence, being a man like to none other of the human kind."

Causes of the dissolution of his empire.

With the death of Alexander fell also the glory of the Macedonians, who very soon relapsed into a situation as bad as, or perhaps worse than, that in which they had been before the reign of Philip. This was occasioned principally by his not having distinctly named a successor, and having no child of his own come to the years of discretion to whom the kingdom might seem naturally to belong. The ambition and jealousy of his mother Olympias, of his queen Roxana, and especially of the great commanders of his army, not only prevented a successor from being ever named, but occasioned the death of every person, whether male or female, who was in the least related to Alexander. To have a just notion of the origin of these disturbances, it is necessary in the first place to understand the state of Macedonian affairs at the time of Alexander's death.

When Alexander set out for Asia, he left Antipater in Macedonia, to prevent any disturbances that might arise either there or in Greece. The Greeks, even during the lifetime of Alexander, bore the superiority which he exercised over them with great impatience; and, though nothing could be more gentle than the government of Antipater, yet he was exceedingly hated, because he obliged them to be quiet. One of the last actions of Alexander's life set all Greece in a flame. He had, by an edict, directed all the cities of Greece to recall their exiles; which edict, when it was published at the Olympic games, created much confusion. Many of the cities were afraid, that when the exiles returned they would change the government; most of them doubted their own safety if the edict took effect; and all of them held this peremptory decree to be a total abolition of their liberty. No sooner, therefore, did the news of Alexander's death arrive than they prepared for war.

In Asia the state of things was not much better; not indeed through any inclination of the conquered countries to revolt, but through the dissensions amongst the commanders. In the general council which was called soon after the death of Alexander, it was at last agreed, or rather commanded by the soldiers, after much confusion and altercation, that Aridæus, the brother of Alexander, who had always accompanied the king, and had been wont to sacrifice with him, should assume the sovereignty. This Aridæus was a man of slender parts and judgment, not naturally, but by the wicked practices of Olympias, who had given him poisonous draughts in his infancy, lest he should stand in the way of her son Alexander or any of his family; and for this, or some other reason, Perdiccas, Ptolemy, and most of the cavalry officers, resented his promotion to such a degree that they quitted the assembly, and even the city. However, Meleager, at the head of the phalanx, vigorously supported their first resolution, and threatened loudly to shed the blood of those who affected to rule over their equals, and to assume a kingdom which nowise belonged to them. Aridæus was accordingly arrayed in royal robes, had the arms of Alexander put upon him, and was saluted by the name of Philip, to render him more popular. Thus were two parties formed, at the head of which were Meleager and Perdiccas, both of them pretending vast concern for the public good, yet at bottom desiring nothing more than their own advantage. Perdiccas was a man of high birth, and had a supreme command in the army, was much in favour with Alexander, and one in whom the nobility had placed great confidence. Meleager had become formidable by the phalanx being on his side, and having the nominal king entirely in his power; for Aridæus, or Philip, was obliged to comply with whatever he thought proper, and publicly declared, that whatever he did was by the advice of Meleager; so that he made his minister accountable for his own schemes, and nowise endangered himself. The Macedonians also, besides their regard for the deceased king, soon began to entertain a personal love for Philip on account of his moderation.

Meleag murdere and the empire vided.

It is remarkable, however, that notwithstanding all the favours which Alexander had conferred upon his officers, and the fidelity with which they had served him during his life, only two of them were attached to the interests of his family after his death. These were Antipater, and Eumenes the Cardian, whom he had appointed his secretary. Antipater, as we have already seen, was embroiled with the Greeks, and could not assist the royal family, who were in Asia; and Eumenes had not as yet sufficient interest to form a party in their favour. In a short time, however, Perdiccas prevailed against Meleager, and caused him to be

Meleager murdered, and the empire divided.

murdered; by which means the supreme power for a time fell into his hands. His first step, in consequence of this power, was to distribute the provinces of the empire amongst the commanders, in order at once to prevent competitors, and to satisfy the ambition of the principal leaders of the army. Aridæus, and the son of Roxana, born after the death of his father, were to enjoy the regal authority. Antipater had the government of the European provinces. Craterus received the title of Protector. Perdiccas was made general of the household troops, in the room of Hephæstion. Ptolemy, the son of Lagus, obtained Egypt, Libya, and that part of Arabia which borders upon Egypt. Cleomenes, a man of infamous character, whom Alexander had appointed receiver-general in Egypt, was made Ptolemy's deputy. Leomedon had Syria; Philotas, Cilicia; Python, Media; Eumenes, Cappadocia, Paphlagonia, and all the country bordering on the Euxine Sea, as far as Trapezus; but these were not yet conquered, so that he was a governor without a province. Antigonus received Pamphylia, Lycia, and Phrygia Major; Cassander, Caria; Menander, Lydia; Leonatus, Phrygia on the Hellespont.

Alexander's body neglected, and his will set aside.

In the mean time, not only Alexander's will, but even his remains, were so much neglected, that his body was allowed to lie seven days before any notice was taken of it, or any orders were given for its being embalmed. The only will he left was a short memorandum of six things which he wished to have done. 1. A fleet of one thousand stout galleys was to be built and employed against the Carthaginians and other nations who might oppose the reduction of the sea-coasts of Africa and Spain, with all the adjacent islands as far as Sicily. 2. A large and regular highway was to be constructed along the coast of Africa, as far as Ceuta and Tangier. 3. Six temples of extraordinary magnificence were to be erected, at the expense of one thousand five hundred talents each. 4. Castles, arsenals, havens, and yards for building ships, were to be established in proper places throughout his empire. 5. Several new cities were to be built in Europe and Asia; those in Asia to be inhabited by colonies from Europe, and those in Europe to be filled with Asiatics; that by blending the people and the manners of both, the hereditary antipathy which had hitherto subsisted between the inhabitants of these two continents might, if possible, be eradicated. Lastly, he had projected the building of a pyramid, equal in size and beauty to the largest in Egypt, in honour of his father Philip. But all these designs were, on the pretence of their being expensive, referred to a council of Macedonians, to be held nobody knew when or where.

The daughters of Darius put to death by Roxana.

The government, being now in the hands of Perdiccas and Roxana, soon became cruel and distasteful. Alexander was scarcely dead when the queen sent for Statira and Drypetis, the two daughters of Darius, one of whom had been married to Alexander, and the other to Hephæstion; and as soon as they arrived at Babylon, she caused them both to be murdered, that no son of Alexander by any other woman, or of Hephæstion, might give any trouble to her or her son Alexander. Sisygambis, the mother of Darius, no sooner heard that Alexander the Great was dead, than she laid violent hands on herself, being apprehensive of the calamities which were about to ensue.

Revolt of the Greeks.

War was first declared in Greece against Antipater in the year 321 before Christ; and, through the treachery of the Thessalians, that general was defeated, with the army he had under his own command. Leonatus was therefore sent from Asia, with a very considerable army, to his assistance; but both were overthrown with great loss by the confederates, and Leonatus himself was killed. In a short time, however, Craterus arrived in Greece with a great army, the command of which he resigned to Antipater. The army of the confederates amounted to about twenty-five thousand foot and three thousand horse; but Antipater commanded no fewer than forty thousand foot, three thousand archers, and five thousand horse. In such an unequal contest, therefore, the Greeks were defeated, and forced to sue for peace, which they did not obtain except on condition of their receiving Macedonian garrisons into several of their cities. At Athens also the democratic government was abrogated; and such a dreadful punishment did this seem to the Athenians, that twenty-two thousand of them left their country and retired into Macedonia.

Disturbances in Asia and Thrace.

Whilst these things were doing in Greece, disturbances began also to arise in Asia and in Thrace. The Greek mercenaries, who were dispersed throughout the inland provinces of Asia, despairing of ever being allowed to return home by fair means, determined to attempt it by force. For this purpose they assembled to the number of twenty thousand foot and three thousand horse; but they were all cut off to a man by the Macedonians. In Thrace, Lysimachus was attacked by one Seuthes, a prince of that country, who claimed the dominions of his ancestors, and had raised an army of twenty thousand foot and eight thousand horse. But though the Macedonian commander was forced to engage this army with no more than four thousand foot and two thousand horse, yet he kept the field of battle, and could not be driven out of the country.

Ambition and cruelty of Perdiccas.

Perdiccas, in the mean time, by pretending friendship to the royal family, had gained over Eumenes entirely to his interest; and at last put him in possession of the province of Cappadocia by the defeat of Ariarathes, king of that country, whom he afterwards caused to be crucified. His ambition, however, now began to involve him in difficulties. At the first division of the provinces, Perdiccas, to strengthen his own authority, had proposed to marry Nicæa, the daughter of Antipater; and so well was this proposal relished, that her brethren, Jollas and Archias, conducted her to him, in order to be present at the celebration of the nuptials. But Perdiccas had now other objects in view. He had been solicited by Olympias to marry her daughter Cleopatra, the widow of Alexander king of Epirus, and who then resided at Sardis in Lydia. Eumenes promoted this match to the utmost of his power, because he thought it would be for the interest of the royal family; and his persuasions had such an effect on Perdiccas, that he was sent to Sardis to compliment Cleopatra, and to carry presents to her in name of her new lover. In the absence of Eumenes, however, Alcetas, the brother of Perdiccas, persuaded him to marry Nicæa; but, in order to gratify his ambition, he resolved to divorce her immediately after the marriage, and to marry Cleopatra. By this last alliance he hoped to have a pretence for altering the government of Macedonia; and, as a necessary measure preparative to these, he entered into contrivances for destroying Antigonus. Unfortunately for himself, however, he ruined all his schemes by his own jealousy and precipitate cruelty. Cynane, the daughter of Philip by his second wife, had brought her daughter Adda, who was afterwards named Eurydice, to court, in hopes that King Aridæus might marry her. Against Cynane, Perdiccas, from some political motives, conceived such a grudge, that he caused her to be murdered. This raised a commotion in the army, which frightened Perdiccas to such a degree that he now promoted the match between Aridæus and Eurydice, to prevent which he had murdered the mother of the young princess. But, in the mean time, Antigonus, knowing the designs of Perdiccas against himself, fled with his son Demetrius to Greece, there to take shelter under the protection of Antipater and Craterus, whom he informed of the ambition and cruelty of the regent.

Civil war.

A civil war was now kindled up. Antipater, Craterus, Neoptolemus, and Antigonus, were combined against Perdiccas; and it was the misfortune of the empire in general that Eumenes, the most able general, as well as the most virtuous of all the commanders, was on the side of Perdiccas, because he believed him to be in the interest of Alexander's family. Ptolemy in the mean time remained in quiet possession of Egypt, but without the least intention of owning any person as his superior. However, he also acceded to the league formed against Perdiccas, and thus the only person in the whole empire who consulted the interest of the royal family was Eumenes.

Alexander buried in Egypt.

It was now thought proper to bury the body of Alexander, which had been kept for two years, during all which time preparations had been making for its interment. Aridæus, to whose care it was committed, set out from Babylon for Damascus, in order to carry the king's body to Egypt. This was much against the will of Perdiccas; for it seems there was a superstitious report, that wherever the body of Alexander was laid, that country should flourish most. Perdiccas, therefore, out of regard to his native soil, would have it conveyed to the royal sepulchres in Macedonia; but Aridæus, pleading the late king's express direction, was determined to carry it into Egypt, from thence to be conveyed to the temple of Jupiter Ammon. The funeral was accordingly conducted with all imaginable magnificence. Ptolemy came to meet the body as far as Syria; but, instead of burying it in the temple of Jupiter Ammon, he erected a stately temple for it in the city of Alexandria; and, by the respect which he showed for his dead master, induced to join him many of the Macedonian veterans, who were afterwards of the greatest service to him.

Perdiccas killed, and a new division of the empire.

No sooner was the funeral over, than both the parties above mentioned fell to blows. Perdiccas marched against Ptolemy, but was slain by his own men, who, after the death of their general, submitted to his antagonist; and thus Eumenes was left alone to contend against all the other generals who had served under Alexander. In this contest, however, he would by no means have been overmatched, had his soldiers been attached to him; but as they had been accustomed to serve under those very generals against whom they were now to fight, they were upon all occasions ready to betray and desert Eumenes. However, he defeated and killed Neoptolemus and Craterus; but then found himself obliged to contend with Antipater and Antigonus. Antipater was now appointed protector of the kings, with sovereign power; and Eumenes was about the same time declared a public enemy. A new division of Alexander's empire took place. Egypt, Libya, and the parts adjacent, were given to Ptolemy, because they could not be taken from him. Syria was confirmed to Leomedon. Philoxenus received Cilicia. Mesopotamia and Arbelitus were given to Amphimachus. Babylon was bestowed on Seleucus. Susiana fell to Antigenes, who commanded the Macedonian *Argyraspidæ*, or Silver Shields, because he was the first who opposed Perdiccas. Peucestas held Persia; Tlepolemus had Caramania; Python had Media as far as the Caspian Straits; Stasander had Aria and Drangia; Philip, Parthia; Stasonor, Bactria and Sogdia; Sybirtius, Aracopa; Oxyartes, the father of Roxana, Paropamisus. Another Python had the country between this province and India. Porus and Taxiles retained what Alexander had given them, refusing to part with any portion of their dominions. Cappadocia was assigned to Nicanor. Phrygia Major, Lycaonia, Pamphylia, and Lycia, were given to Antigonus; Caria to Cassander; Lydia to Clytus; and Phrygia the Less to Aridæus. Cassander was appointed general of the horse; whilst the command of the household troops was given to Antigonus, with orders to prosecute the war against Eumenes. Antipater having thus settled every thing as well as he could, returned to Macedonia with the two kings, to the great joy of his countrymen, having left his son Cassander as a check upon Antigonus in Asia.

Total destruction Alexander's family.

Matters now seemed to wear a better aspect than they had yet done; and, if Eumenes had believed that his enemies really consulted the interest of Alexander's family, there is not the least doubt that the war would have been immediately terminated. He saw, however, that the design of Antigonus was only to set up for himself, and consequently he refused to submit. From this time, therefore, the Macedonian empire in Asia ceased to exist; and the Macedonian affairs were now entirely confined to that kingdom itself, and to Greece. Antipater had not been long returned to Macedonia, when he died; and the last action of his life completed the ruin of Alexander's family. With a view to the public good, he had appointed Polysperchon, one of the eldest of Alexander's captains, to be protector and governor of Macedonia. This failed not to disgust his son Cassander, who thought he had a natural right to these offices, and of course kindled up a new civil war in Macedonia. This was indeed highly promoted by his first actions as a governor. He began with attempting to remove all the governors appointed in Greece by Antipater, and to restore democracy wherever it had been abolished. The immediate consequence of this was, that the people refused to obey their magistrates; the governors refused to resign their places, and applied for assistance to Cassander. Polysperchon had also the imprudence to recall Olympias from Epirus, and to allow her a share in the administration, which Antipater, and even Alexander himself, had always refused her. The consequence of all this was, that Cassander invaded Greece, where he prevailed against Polysperchon. Olympias returned to Macedonia, where she cruelly murdered Aridæus and his wife Eurydice. But she was herself put to death by Cassander, who afterwards caused Roxana and her son to be murdered; and Polysperchon being driven into Etolia, first raised to the crown Hercules the son of Alexander by the daughter of Darius, and then, by the instigation of Cassander, murdered him, by which means the line of Alexander the Great became totally extinct.

Various r volutions in the government

Cassander having thus destroyed all the royal family, assumed the regal title, as he had for sixteen years before had all the power. But he enjoyed the title of king of Macedonia only three years, after which he died, about 298 before Christ. By Thessalonica, the daughter of Philip king of Macedonia, he left three sons, Philip, Antipater, and Alexander. Philip succeeded him, but soon afterwards died of a consumption, and a contest immediately began between the two brothers, Antipater and Alexander. Antipater seized the kingdom, and, to secure himself in it, murdered his mother Thessalonica. Alexander invited Pyrrhus king of Epirus, and Demetrius the son of Antigonus, to assist him and revenge the death of his mother. But Pyrrhus being bought off, and a peace concluded between the brothers, Alexander, afraid of having too many protectors, formed a scheme of getting Demetrius assassinated. Instead of this, however, both he and Antipater were put to death; and Demetrius became king of Macedonia, four years after the death of Cassander.

In 287 before Christ, Demetrius was driven out by Pyrrhus, who was again driven out two years after by Lysimachus, who was soon afterwards killed by Seleucus Nicanor; and Seleucus in his turn was murdered by Ptolemy Ceraunus, who became king of Macedonia about 280 before our era. The new king was in a short time cut off, with his whole army, by the Gauls; and Antigonus Gonatus, the son of Demetrius Poliorcetes, became king of Macedonia in 278 before Christ. He proved successful against the Gauls, but was driven out by Pyrrhus king of Epirus, who, however, soon disobliged his subjects to such a degree that Antigonus recovered a great part of his kingdom. But in a little time, Pyrrhus being killed at the siege of Argos in Greece, Antigonus was restored to the whole of Macedonia; but scarcely was he seated on the throne, when he was driven from it by Alexander the son of Pyrrhus. The new invader was in his turn expelled by Demetrius the son of Antigonus, who, though at that time but a boy, had almost made himself master of Epirus. In this enterprise, however, he was disappointed; but by his means Antigonus was restored to his kingdom, which he governed for many years in peace. By a stratagem he made himself master of the city of Corinth, and from that time began to form schemes for the thorough conquest of Greece. The method he took to accomplish this was, to support the petty tyrants of Greece against the free states, which indeed weakened the power of the latter, but involved the whole country in so many calamities, that these transactions redound but little to the reputation either of his arms or of his honour. He died about the year 243, leaving the kingdom to his son Demetrius II.

Neither Demetrius nor his successor Antigonus Doson performed any thing remarkable. In 221 before Christ, the kingdom fell to Philip, the last but one of the Macedonian monarchs. To him Hannibal, after the battle of Cannæ, applied for assistance, which he refused; and the same imprudence which made him refuse this assistance prompted him to embroil himself with the Romans, and at last to conclude a treaty with them, by which he in effect became their subject, being tied up from making peace or war except according to their pleasure. In 179 before Christ he was succeeded by his eldest son Perseus, under whom the war with the Romans was renewed. Even yet the Macedonians were terrible in war; and their phalanx, when properly conducted, seems to have been absolutely invincible by any method of making war at that time known. It consisted of sixteen thousand men, of whom one thousand marched abreast, and thus was sixteen men deep, each of whom carried a kind of long pike denominated *sarissa.* The soldiers stood so close together, that the fifth rank extended the points of their pikes beyond the front of the battle. The hindermost ranks leaned their pikes upon the shoulders of those who went before them, and, locking them fast, pressed briskly against them when they made the charge; so that the first five ranks received the impetus of the whole phalanx, which was the reason why the shock generally proved irresistible. (See the article ARMY, in which the constitution of the phalanx is fully explained.) The Romans had never encountered such a terrible enemy; and in the first battle, which happened 171 before Christ, they were defeated with the loss of two thousand two hundred men, whilst the Macedonians lost no more than sixty. The generals of Perseus now pressed him to storm the enemy's camp; but he being naturally of a cowardly disposition, refused to comply, and thus the best opportunity he ever had was lost. Still, however, the Romans gained little or no advantage over it, until the year 168 before Christ, when Paulus Æmilius, a most experienced commander, was sent to Macedonia. Perseus now put every thing upon the issue of a general engagement; and Æmilius, with all his courage and military experience, would have been defeated, had the Macedonians been commanded by a general of the smallest courage or conduct. The light-armed Macedonians charged with such vigour, that, after the battle, some of their bodies were found within two furlongs of the Roman camp. When the phalanx came to charge, the points of their spears striking into the Roman shields, kept the heavy-armed troops from making any motion; whilst, on the other hand, Perseus's light-armed men did terrible execution. On this occasion, it is said that Æmilius tore his clothes, and gave up all hopes. However, the Roman general, perceiving that as the phalanx gained ground it lost its order in several places, caused his own light-armed troops to charge in those places, whereby the Macedonians were soon thrown into confusion. If Perseus with his horse had, on the first appearance of this, charged the Romans briskly, his infantry would have been enabled to recover themselves; but instead of this, he betook himself to flight, and the infantry at last did the same, but not till twenty thousand of them had lost their lives.

This battle decided the fate of Macedonia, which immediately submitted to the conqueror. The cowardly king took refuge in the island of Samothrace, but was at last obliged to surrender to the Roman consul, by whom he was carried to Rome, led in triumph, and afterwards most barbarously treated. Some pretenders to the throne afterwards appeared; but being unable to defend themselves against the Romans, the country was reduced to a Roman province in the year 148 before Christ.

MACEDONIANS, in *Ecclesiastical History*, the followers of Macedonius, bishop of Constantinople, who, through the influence of the Eunomians, was deposed by the council of Constantinople in 360, and sent into exile. He considered the Holy Ghost as a divine energy diffused throughout the universe, and not as a person distinct from the Father and the Son. The sect of Macedonians was crushed before it had arrived at its full maturity, by the council at Constantinople, in the year 381.

MACER, EMILIUS, an ancient Latin poet, was born at Verona, and flourished under Augustus Cæsar. Eusebius relates that he died a few years after Virgil. Ovid speaks of a poem of his, on the nature and quality of birds, serpents, and herbs, which he says Macer, being then very old, had often read to him. There is extant a poem under Macer's name, upon the nature and power of herbs; but it is evidently spurious. He also wrote a supplement to Homer, as Quintus Calaber did afterwards in Greek.

MACERATA, a delegation of the papal dominions in Italy, in the march of Ancona, and on the Adriatic Sea, extending over 1072 square miles, and containing eight cities, sixteen market-towns, thirty-seven villages, and 197,890 inhabitants. The capital is the city of the same name. It stands on a delightful plain overlooking the Adriatic, and is well built, with broad paved streets. It is the seat of a bishop, and contains eight monasteries, five nunneries, and, besides the cathedral, thirteen churches, with 15,500 inhabitants. There is a university, founded in 1290 and re-established in 1540, a Jesuits' college, and a gymnasium for nobles. Long. 13. 21. E. Lat. 45. 18. 36. N.

MACERATION is an infusion or soaking of ingredients in water, or any other fluid, in order either to soften them or extract their virtues.

MACHAON, a celebrated physician amongst the ancients, was the son of Æsculapius and brother to Podalirius. He went to the Trojan war with the inhabitants of Trica, Ithome, and Œchalia. According to some, he was king of Messenia. He was physician to the Greeks, and healed the wounds which they received during this long war. Some suppose that he was killed before Troy, by Eurypylus, the son of Telephus. He received divine honours after his death, and had a temple in Messenia.

MACHÆRUS, in *Ancient Geography*, a citadel on the other side of Jordan, near the mountains of Moab, not far from and to the north of the Lake Asphaltites. It was the south boundary of the Peræa, and situated on a mountain encompassed round with deep and broad valleys, being built by Alexander king of the Jews. It was destroyed by Gabinius in the war with Aristobulus, and rebuilt by Herod, with a town of the same name around it. Here John the Baptist was beheaded.

MACHAULT, a town of the department of the North, and arrondissement of Bouziers, in France. It is an ancient place, with 1200 inhabitants.

MACHECOUL, a city of France, in the department of the Lower Loire, and arrondissement of Mentz. It is situated on the river Tenu, and contains 600 houses, with 3650 inhabitants. Long. 1. 57. W. Lat. 47. 2. N.

MACHERLA, a town of Hindustan, in the province of the Carnatic, district of Palnaud, 106 miles south from Hyderabad. Long. 78. 54. E. Lat. 16. 8. N.

MACHIAVELLI, Nicolo, for many years secretary of the republic of Florence, and justly celebrated for his political, historical, and other writings, was born at Florence on the 3d of May 1469, being descended from a family which traced its origin up to the ancient marquises of Tuscany, particularly to the Marquis Hugo, who lived about the middle of the ninth century. The Machiavellis were signors or lords of Monte-Spertoli; but preferring the right of citizenship in Florence to the useless conservation of privileges which were daily becoming more and more obnoxious to the rising commonwealth, they prudently submitted to its laws in order to accept employment in the highest offices of the magistracy. This family was one of those attached to the Guelfic party which abandoned Florence in the year 1260, after the defeat at Monte-Aperti. But their secession was merely temporary. Having returned to their native country, they regained their influence, and occupied some of the first offices of the state; no less than thirteen of their number having held the situation of gonfaloniere of justice, and fifty-three that of prior, dignities which were then considered as the most important in the republic. The father of Machiavelli was a jurisconsult, and lived in a state but little removed from poverty. His mother, who appears to have been a woman of talent, loved poetry, and composed verses with facility. It is believed that, about the year 1494, he was placed under the tuition of the learned Marcello di Virgilio, professor of Greek and Latin literature, and the translator of Dioscorides. How long he remained under the care of this master, or what advantages he derived from his instructions, has not been ascertained. But, five years later, when he had scarcely completed his twenty-ninth year, he was preferred, amongst four competitors, to the employment of chancellor of the second chancery of the Signory; a few months afterwards, he was appointed, by the Signory and the colleges, secretary to the ten magistrates of liberty and peace, which constituted the general government of the republic; and with this employment he continued invested for about fourteen years and a half. His ordinary occupations, when he resided at Florence, comprehended the political correspondence, both internal and external, the recording of the deliberations of the council of magistrates, and the redaction of treaties with foreign states.

But the Florentine government, justly appreciating the talents of Machiavelli, were not long in extending his functions; and he was in consequence successively intrusted with no less than twenty-three foreign legations, besides frequent commissions to the cities dependent on the republic. The first mission on which he was despatched was to France, where he arrived in 1500, soon after the raising of the siege of Pisa. Louis XII. had furnished to the Florentines troops and artillery to form the siege of that place; and the republic had sent to the camp two commissioners, besides its secretary Machiavelli, who carried on the correspondence. The Pisans, however, negociated with the king, and at the same time gained over the principal officers in the besieging army. The French troops were to be paid by the Florentines, but some delay having occurred in forwarding their pay, they availed themselves of this as a pretext, and having disbanded, the siege was in consequence raised. The French king reproached the Florentines for the disgrace which had thus been brought on his arms; and it was to appease him, and if possible to obtain fresh succours, that they sent to France Machiavelli, and Francisco della Casa, who had been one of the commissioners in the camp before Pisa. During this negociation, which lasted five months, the deputies followed the court to Saint-Pierre-le-Moutier, Montargis, Melun, Blois, Nantes, and Tours. They had several audiences of the king, and his minister Cardinal d'Amboise; but these led to no satisfactory result. The envoys were continually met with the same reproaches, and the court was only appeased by the reimbursement of the sums which the king had advanced to the troops.[1]

In the year 1502 Machiavelli was sent to the Duke di Valentino (Cesare Borgia) at Imola, and next to Rome. He also went a second time to France, and afterwards to Siena, to Piombino, and to Perugia. In 1507 he proceeded by Geneva to Constance, and from thence to Bolzano, at that time the residence of the Emperor Maximilian, with whom he treated of important affairs. The relation of this mission is printed amongst his complete works, under the title of *Rapporto di cose della Magna, fatto questo dì* 17 *giugno* 1508. In 1510 he re-appeared in France, and, after passing about two months at Blois, witnessed the opening of the national council at Tours. A fourth mission to the court of Louis XII. is commonly referred to the following year, 1511; but it appears uncertain whether it was actually undertaken. It may with truth be said, however, that if Machiavelli failed to secure the complete independence of his country, this proceeded from no fault of his own; inasmuch as the accomplishment of such an object would have required more confidence on the part of his fellow-citizens, greater harmony between the different opinions which then divided the city, and times less turbulent and unpropitious. But the glory cannot be denied him of having attempted this noble enterprise, and devoted to its accomplishment all his genius, and all the influence which he was permitted to exercise in the conduct of public affairs.

This is fully established by his political correspondence, which, besides, is in the highest degree valuable and interesting. His despatches, indeed, form one of the most amusing and instructive collections extant. In them we meet with none of that mystical and verbose jargon which is so common in modern state-papers. The narratives are clearly and agreeably written, and the remarks on men and things are equally shrewd and judicious. We are introduced into the presence of men who, during twenty years, swayed the destinies of Europe. Their wit and their folly, their gloom and their gaiety, are alike exposed to us; we are admitted to overhear their familiar talk, to see the masters of the world in undress, and to observe the manifestations of their real characters. It is interesting and curious to recognise, in circumstances which commonly elude the notice of historians, the feeble violence and the shallow cunning of Louis XII.; the bustling insignificance of Maximilian, a prince afflicted with an impotent desire of renown, rash yet timid, obstinate yet fickle, always in a hurry, yet always too late; the fierce and haughty energy which gave dignity to the eccentricities of the magnificent Julius; and the soft, smooth, calm, graceful manners which masked the insatiable ambition and deadly hatred of Cesare Borgia. The meeting of the Florentine secretary and the Duke di Valentino, of the greatest speculative and the ablest practical statesman of the age, is a memorable occurrence in the history of both. Upon two important occasions Machiavelli was admitted to the society of Borgia; once, at the moment when his splendid villany had achieved its most signal triumph, when he caught in one snare, and crushed at one blow, all his most formidable rivals;[2] and again when, exhausted by disease, and overwhelmed by misfortunes, he was the prisoner of the deadliest enemy of his house. These interviews are fully described in the correspondence. Several writers have supposed that there existed a close and intimate connexion between these remarkable men, and the secretary-envoy has even been accused of prompting the crimes of this artful and merciless tyrant; but, from the official documents, it is evident that their intercourse, though ostensibly of an amicable, was in reality of a hostile description. "It cannot be doubted, however," says an able writer, "that the imagination of Machiavelli was strongly impressed, and his speculations on government coloured, by the observations which he made on the singular character, and equally singular fortunes, of a man who, under such disadvantages, had achieved such exploits; who, when sensuality, varied through innumerable forms, could no longer stimulate his sated mind, found a more powerful and durable excitement in the intense thirst of empire and revenge; who emerged from the sloth and luxury of the Roman purple the first prince and general of the age; who, after acquiring sovereignty by destroying his enemies, acquired popularity by destroying his tools; who had begun to employ for the most salutary ends the power which he had attained by the most atrocious means; who tolerated within the sphere of his iron despotism no plunderer or oppressor but himself; and who fell at last, amidst the mingled curses and regrets of a people, of whom his genius had been the wonder, and might have been the salvation."[1] Some of the crimes of Borgia, which appear to us the most revolting, would not have been viewed with equal horror by an Italian of the fifteenth century; and, besides, patriotic feeling might induce Machiavelli to regard with indulgence and regret the memory of the only leader capable of defending the independence of Italy against the confederate spoilers who were then plotting the dismemberment of that divided and unhappy country.

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[1] Ginguené, *Histoire Littéraire d'Italie*, tom. viii.

[2] See in *Opere di Machiavelli* (vol. ii. Hague, 1726), *Descrittione del modo tenuto dal Duca Valentino nello amazzare Vitellozzo-Vitelli, Oliverotto da Fermo, il Signor Pagolo, et il Duca di Gravina Orsini.*

But whilst Machiavelli deeply regretted the misfortunes of his country, he clearly discerned the cause and the remedy of these. It was the military system of the Italian people which had extinguished their valour and discipline, destroyed their independence, and rendered their wealth an easy prey to every foreign plunderer. Machiavelli projected a scheme for abolishing the practice of employing mercenary troops, and organizing a national militia; and the exertions which he made to accomplish this grand object are alike honourable to his understanding and his patriotism. He studied with assiduity the art of war, and made himself master of all its details.[2] When levies were decreed, he flew from place to place to superintend the execution of his design, and availed himself of every circumstance which could contribute to its success. For a time the scheme promised well, and the new troops acquitted themselves respectably. But the fury of parties continued to increase, and the tide of misfortune came on before the barriers which should have withstood it were prepared. The emperor and the pope wished to re-establish the Medici, and the moment was favourable for such an enterprise. Florence was then governed by the gonfaloniere Soderini, a man equally presumptuous and feeble, who obstinately adhered to France, without discerning that that power was not in a condition to afford him any aid. It was in reference to this inconsiderate policy that Machiavelli observed, "The good fortune of France has made us lose half the state; her bad fortune will cause the loss of our liberty."[3] The prediction was not long in being verified. As soon as the French armies had lost their superiority in Italy, the storm burst upon Florence. In 1512, the pope and the emperor combined against their common enemy, and, contrary to the faith of treaties, imposed a contribution of a hundred thousand florins. Machiavelli flew through the territory of the republic, to examine the state of the fortresses, and organize a vigorous resistance; but all his efforts were unavailing, and divided Florence soon opened its gates to the Medici, who re-conquered at once their property and their ancient authority.

This revolution, which caused the ruin of the gonfaloniere, proved also the signal for the fall of the secretary. The new Signory immediately attacked him in two decrees, dated the 8th and 10th of November 1514. By the one he was deprived, "absolutely despoiled," of his offices of chancellor and secretary to the ten magistrates of liberty and peace; by the other he was exiled for a year to a part of the Florentine territory, which he was forbidden to quit under the penalty of incurring the displeasure of the Signory. A third decree, dated the 17th of the same month, prohibited him from entering the palace of the high and magnificent signors. On this subject Ginguené has omitted some facts. "Machiavelli," says he, "after fourteen years of service useful to his country, was first deprived of his employment, and then confined for a year to the territory of the republic, with a prohibition not to set foot in the palace of the Signory. Nor was this the term, it was in fact only the commencement of his misfortunes." And he adds in a note, that the fate of the secretary was decided by three decrees of the 8th, 10th, and 17th of November. There appears to be some confusion in this statement. The decree of the 17th was evidently a mitigation of that of the 10th. The latter banished him for a year, and intimated to him that he was not to leave the territory of the republic; that is, it ordained him to quit Florence in order to live in the Florentine dominions, exclusive of the city properly so called. The third decree, dated the 17th, only prohibited him from entering the palace of the Signory, without ordaining him to leave the city; but another decree of the same date was published, in which he was permitted to enter the palace during the whole of the day of the 17th; and the same liberty was granted him on the 4th of December 1512, and on the 21st of March and 9th of July 1513. Ginguené has refuted some of the statements published respecting the treatment Machiavelli is alleged to have experienced after the return of the Medici; but it is not the less true, as appears by the subsequent modifications of the original decree, to the extent already stated, that the removal of the secretary was considered as an affair of some difficulty, and one the accomplishment of which required management and address. But when this object had been effected, he found himself exposed to the greatest dangers. Accused of being concerned in the conspiracy formed by Capponi and Boscoli against Cardinal de' Medici, afterwards Leo X., he was thrown into prison, and put to the torture, which he endured with unflinching resolution. "I have been near losing my life," said he, "which God and my own innocence have saved; I have supported all evils, including imprisonment and others." On the accession of Leo X. he was included in an amnesty, and owed his deliverance to the generosity of that liberal and accomplished pontiff.

These terrible trials, which extraordinary courage can alone withstand, attest the energy and the force of character which belonged to the fallen statesman. Instead of yielding to despondency, he sought for an alleviation of his lot in study and in literature; and it is to his misfortunes that we are indebted for the best known of his works, the

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[1] *Edinburgh Review*, vol. xlv. pp. 283, 284.

[2] See his treatise *Dell' Arte della Guerra*, passim.

[3] Speaking, on one occasion, of the alliance with France, he observed, *che la buona fortuna di essa aveva fatto perder la metà dello stato, la cattiva avrebbe fatto perdere la libertà.*

Prince, the dialogue on the *Art of War*, his *Histories*, and *Comedies*, which he composed during his retirement at San-Casciano, and which, with the collection of his political letters, deserve to be classed amongst the most remarkable monuments of modern literature. From his retreat, however, he wrote to the friends whom he had still preserved, signifying his desire to be again employed in the conduct of affairs; and his wishes in this respect were to a certain extent gratified. After the death of Lorenzo de' Medici, Leo X. who possessed great influence in the government of Florence, recalled Machiavelli, and requested him to point out the means of reforming the administration. In 1521, there was confided to him a mission to the minor brothers at Carpi. He was next ordered to fortify anew the city, and to treat of some affairs with Francisco Guicciardini, then governor of Romagna. Finally, he was employed in the army of the league against Charles V. This commission was the last remarkable occupation of his life. He returned to Florence in one of the last days of May 1527, and having, not long afterwards, suffered much inconvenience from pains in the stomach, he took a medicine in which he had great faith for relieving this disorder; but being soon attacked by violent spasms in the bowels, he expired on the 22d of June, at the age of fifty-eight, after having received all the sacraments of the church. The following letter from his son Pietro to Francisco Nelli, professor at Pisa, annihilates all the fables which have been circulated respecting his death:—"I cannot tell you without tears, that, on the 22d of this month, our father Nicolo died of pains in the bowels, caused by a medicine which he had taken two days before. He was made to confess his sins by the friar Matteo, who kept him company till his death. Our father has left us in great poverty, as you know." Machiavelli was in his person of the ordinary size, his complexion was of an olive hue, and his physiognomy animated and expressive; in conversation he was at once simple and lively, and his repartee was prompt and piquant. Conversing one day with Clodio Tolomeo, the latter said to him, "At Florence the men have less science, and are less learned, than at Siena, always excepting yourself;" to which Machiavelli replied, "At Siena the men are greater fools than at Florence, not even excepting you." Some one having remarked to him that he had taught princes to be tyrants, he replied, "If I have taught princes to be tyrants, I have also taught the people to destroy tyrants." He was interred in the church of Santa-Croce, in the burying-place of his family; but for more than two centuries his bones lay undistinguished, and it was reserved for an English nobleman, Earl Cowper, to pay the last honours to the greatest statesman of Florence, by erecting a monument to his memory.[1]

Several writings of the Florentine secretary are regarded as estimable productions of a superior mind; others are considered as pernicious, and containing abominable doctrines. Amongst the latter are the apology for the conduct of the Duke di Valentino, when he caused Vitellozzo-Vitelli and others to be massacred at Sinigaglia (*Il modo tenuto dal Duca Valentino*, &c.); the treatise of the Prince (*Il Principe*); and some detached opinions contained in the Discourses on Titus Livius (*Discorsi sopra la prima deca di T. Livio*), which opinions, forming part of a writing posterior to the composition of the *Principe*, will, as far as possible, be explained in the more detailed exposition which we shall endeavour to give of the object and intentions of the author when he composed that celebrated treatise.

At the head of the works generally admitted to have established beyond all dispute the reputation of Machiavelli as a profound thinker, and a politician of inexhaustible genius, may be placed those letters or despatches, published under the title of *Legazioni*, of which we have already spoken incidentally. Ginguené has observed, in reference to these letters, that one would not willingly read the collection, which he considers somewhat diffuse, but that, in regard to the character and life of the secretary, and the history of his own time, it may be consulted with advantage. In this opinion, however, we cannot by any means concur. The collection is suited to the taste of the age, and the country to which it belongs; nor has this taste materially changed; for even the Italian diplomatists of the present day frequently indulge in similar details, introducing such arguments as they think fitted to support their observations, and to create a favourable impression of their zeal and industry. That the *Legazioni* sometimes descended into minutiæ which may be considered as trifling or irrelevant, we readily admit; but even these particulars are by no means devoid of interest; and as to the entire collection, a reader of intelligence cannot peruse it without being at once amused and instructed by it.

The seven books on the Art of War (*Dell' Arte della Guerra*) show that Machiavelli was profoundly conversant with the principles of military science. An Italian writer, adverting to this circumstance, observes, that such knowledge is not only wonderful in a man devoted to civil occupations, but might even be considered as extraordinary in an old general. According to the author of the preface to the edition of 1813, Machiavelli had acquired this insight into military science in consequence of profound meditations on the works of the ancient Romans, who may be regarded as the first masters of the art of war; and, in fact, the combinations of the secretary have constant reference to those of Vegetius. His principal object was to establish the superiority of infantry, at a time when this branch of the service had fallen into general discredit; and his theories fortunately attracted so much regard, that to him may, in a great measure, be attributed the return of sound tactics, and the perfection to which the art of war subsequently attained. Algarotti, in his fourth discourse on the studies of Palladio, gives us to understand that that celebrated architect learned the military art in the writings of the Florentine secretary; Frederick II. has described, in agreeable verses, some of his military precepts; and there is a French work, entitled *Instructions sur le fait de la Guerre, extraites des livres de Polybe, Frontin, Vegèce, Machiavelli, et plusieurs autres bons auteurs*, Paris, 1563. Of the tactics of Machiavelli it is not necessary to express here any opinion. But the treatise is able and interesting; as a commentary on the history of the times it is invaluable; whilst the ingenuity, grace, and perspicuity of the style, and the eloquence and animation of particular passages, must give pleasure even to readers who take no interest in the subject which the author treats with so much skill and ability.[2]

The *Discorsi*, written about the year 1516, the epoch of

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[1] This monument, which is the work of Spinazzi, bears the inscription, *Tanto nomini nullum par elogium, Nicolaus Machiavelli obiit* A. P. V. MDXXVII.

[2] The treatise on the Art of War is in the form of a dialogue, and the opinions of the writer are put into the mouth of Fabrizio Colonna, a nobleman of the ecclesiastical state, and an officer of distinguished merit in the service of the king of Spain. After some preliminary conversation, Fabrizio expresses his regret that those who in later times affected the manners of the old Romans, should select for imitation their most trifling pursuits. This leads to a discourse on the decline of military discipline, and the best means of restoring it. The institution of the Florentine militia, to which we have already alluded, is very ably defended; and several improvements are suggested in the details.

The Swiss and the Spaniards were at this time regarded as the best soldiers in Europe. The Swiss battalion consisted of pikemen in deep formation, and bore a close resemblance to the Grecian phalanx. The Spaniards, like the soldiers of Rome, were armed his disgrace, prove that the principles of the author were uniform and constant, and that his views and observations had always a character of justness, depth, and gravity. The Roman republic, in its constitution and its establishments, contained the germs of its greatness; and the inroads committed upon these were the causes of its decline. Machiavelli followed this fatal progress beyond the history of Livy; he discerned and meditated on it in the *Annals* and in the *History* of Tacitus. He there found not only facts, but results; a manner and a style, which he adopted as models. Tacitus became his master in the art of observing, and also, in one sense, in the art of writing; what he had acquired in the study of the former of these two great historians he carried to the school of the latter; and it may be said that he learned from Tacitus to read and explain Livy. After having laid the foundations of his work on the history of Rome, Machiavelli employed himself in following Livy step by step in the perusal of that history; stopping short at every thing which suggested a reflection, or indicated the application of a principle. The text of the historian disappears, or is but rarely cited; actions, institutions, and laws, are alone discussed. The objects of comparison, ancient as well as modern, spring up, so to speak, every instant; luminous results are thence deduced; and an inexhaustible variety of facts continually supports the evidence of the reasonings and the solidity of the maxims. Throughout we discover a mind habituated to profound meditations, and a firmness of soul tried and exercised by the storms of liberty. See, for example, to what he reduces, in his fourth chapter, all the noise made by the quarrels between the senate and the Roman people, which he does not hesitate to regard as the primary cause of the liberty of Rome. Observe also, in his seventh chapter, the strong reasons upon which he grounds the utility, or rather the necessity, of public accusations; and with what justness of discrimination he distinguishes, in his eighth chapter, the effect of public accusations, preferred on public grounds, from those of adulation and calumny. In a word, he reasons inductively from history as he finds it, and deduces his conclusions, not from any appeal to general or speculative principles, but from the facts as these are detailed in the pages of the historian. If he errs, it is only because his experience, acquired in a peculiar state of society, does not always enable him to calculate the effect of institutions differing from those of which he had observed the operation; but in regard to all that comes within the sphere of his own observation or experience, his sagacity is seldom at fault, and he may justly be considered as the founder of that science which has been somewhat vaguely denominated the philosophy of history.

The books *Delle Historie Fiorentine*, a work in which he begins by describing the events which brought about the destruction of the Roman empire, are altogether an admirable composition, and entitle Machiavelli to a separate place amongst historians, seeing that the ancients have not left any model on which he could form a particular style. The first book displays the science and penetration of the writer; and it may be supposed that Bossuet was filled with admiration of his free, bold, rapid, and independent manner, when he sketched the plan of his Discourse on Universal History. The narrative in the seven other books proceeds with the same vivacity; nor can the most careless reader fail to receive from it a vivid and faithful impression of the national character and manners of the Florentines. This work was undoubtedly the last of the author. He is believed to have completed it in 1525; and it was his intention, we are told, to continue it, which is rendered probable by the fragments collected after his decease. The general character of Machiavelli's style, particularly in the History and in the Life of Castruccio, is elegance and simplicity. He is always full of grace without artifice, and of elegance without insipidity; he is clear without being verbose, and concise without obscurity or pretension to the mysterious; and such is the transparency of the medium through which his ideas are conveyed, that the actual depth of the current of thought is not at first discernible.

Although the real merit of the Florentine secretary consists in his profound knowledge of the science of government, in which he has not been surpassed either amongst the ancients or the moderns, yet he is also entitled to a distinguished place amongst comic authors. His *Mandragola*, which, according to Voltaire, surpasses all the comedies of Aristophanes, is superior to the best of Goldoni, and inferior only to the best of Molière; in fact, it is the work of a man who, if he had devoted himself to the drama, would probably have attained the very highest excellence, and produced a permanent and salutary impression upon the national taste. By the correct and vigorous delineation of human character, it produces interest without a skilful or pleasing plot, and laughter without the least ambition or affectation. Machiavelli had an exquisite sense of the ridiculous, and his dramatic humour, which has often been compared to that of Molière, and certainly resembles it in comic force, if not in benevolent gaiety and chastened morality, seldom fails to prove effective. The *Clizia* is an imitation of the *Casina* of Plautus, which is itself an imitation of the lost Κληρουμενοι of Diphilus. Machiavelli has executed his task with judgment and taste, accommodating the plot to a different state of society, and dexterously connecting with it the history of his own times. Besides these, the *Maschere*, the *Andria*, and two other comedies without titles, the one in prose and the other in verse, appear amongst the works of Machiavelli. The charming little novel of *Belphegor* is also pleasantly conceived and wittily told; but the extravagance of the satire in some measure injures its effect. Machiavelli was unhappily married; and his wish to avenge his own cause as well as

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with the sword and the shield. But the victories gained by Flaminius and Æmilius over the Macedonian kings seemed to prove that the weapons used by the legions were superior to those of the phalanx. And the same experiment had been recently tried with the same result at the battle of Ravenna, "one of those tremendous days into which human folly and wickedness compress the whole devastation of a famine or a plague." In that dreadful conflict, the infantry of Aragon, deserted by their allies, hewed a passage through the thickest of the imperial pikes, and effected an unbroken retreat, in the face of the gensdarmerie of De Foix, and the artillery of Este. Machiavelli, struck with these facts, proposes to combine both systems; to arm the foremost lines with the pike, for the purpose of repulsing cavalry, and those in the rear with the sword, as being a handy weapon, adapted to almost every exigency. He expresses the highest admiration of the military science of the ancient Romans, and the greatest contempt for the maxims in vogue amongst the Italian commanders of the preceding generation; he prefers infantry to cavalry, and fortified camps to fortified towns; he recommends the substitution of rapid movements and decisive engagements for the languid and dilatory operations of his countrymen; and he attaches but little importance to the invention of gunpowder, which, he seems to think, ought scarcely to produce any change in the mode of arming or disposing troops. The artillery of those days was ill constructed, ill served, and consequently of little use in the field of battle; this arm was then in a rude, inefficient state, and hence might in a great measure be disregarded in a general system of tactics; but if Machiavelli could have foreseen the improvements which were destined to take place, particularly in point of mobility, he would have been convinced that a change both in the mode of arming and disposing troops would in consequence become necessary, and that the deep formations of ancient times durst no longer be opposed to the ravages of shot, shells, grape, canister, and the other destructive missiles discharged by modern artillery.

that of his brethren in misfortune carried him beyond even the license of fiction.[1]

Machiavelli was also a poet, though, in this capacity, he is not perhaps entitled to a very high place. The *Decennali* are merely abstracts in verse of the history of his own times. The style and versification are sedulously modelled on those of Dante; but the manner of Dante, like that of every other great original poet, was suited only to his own genius and his own subject, and did not therefore admit of being copied or imitated. The *Assino d'Oro* and the *Capitoli* are also formed on the same model, and are in every respect superior. The Golden Ass indeed has nothing but the name in common with the romance of Apuleius, which, in spite of its irregular plan and vicious style, is one of the most fascinating books in the Latin language, combining the various merits of Le Sage and Radcliffe, Bunyan and Crébillon. The poem of Machiavelli, which is evidently unfinished, is copied from the earlier cantos of the Inferno; whole lines are transferred without acknowledgment, and all without producing their wonted effect; the flowers of language which have bloomed upon one soil, wither when transplanted to another. Yet the *Assino d'Oro* is not altogether destitute of merit; the allegory displays considerable ingenuity, and there is some vivid colouring in the descriptions.

But, of all the works of Machiavelli, that which has excited the greatest attention is the celebrated treatise entitled *Il Principe*. This production, in which the ferocious Borgia is, according to the supposition of several writers, presented as a model to sovereigns who wish to govern absolutely, has acquired a deplorable reputation in Europe, and made the author himself be regarded by many as an incarnation of the evil principle.[2] The first edition, known as that of Antonio Blado d'Asola, appeared at Rome on the 4th of January 1532, accompanied with a privilege of Pope Clement VII. and dedicated to Philip Strozzi, the friend of the author. Bayle speaks of an edition of 1515, which no one has seen, there being, in all probability, a misprint in the date. The Giunta reprinted the *Prince* the same year, 1532, and again in 1540. The sons of Aldus also published it at Venice in 1540; and Gabriel Giolito gave an edition of it in 1550. It was successively translated into German, Montbéliard, 1626; twice into Latin; then into French by Amelot de la Houssaye (Amsterdam, 1683, and Hague, 1743), and, lastly, by Giraudet in 1799, along with the complete works of the author.

We know not of any work which has excited so much discussion and controversy as this, or which has been so often and so vehemently assailed. The intentions of the author have been variously interpreted. Some, thinking they saw in it a complete system of irreligion, impiety, and tyranny, have cried out "Wolf, wolf;"[3] whilst others have demanded that, according to the rules of just criticism, the work should be judged of as a whole, not by detached or disfigured fragments, and that, above all, the disapprobation with which the author always accompanies the exposition of the perverse principles he has developed, should not be dissembled or concealed. Voltaire, writing to the prince-royal of Prussia (20th May 1738), observes: "The first thing I am obliged to advert to is the manner in which you think of Machiavel. Why should you be moved with the virtuous displeasure which you express against me because I have praised the style of a bad man? It is for the Borgias, father and son, and all those petty princes who require crimes to effect their elevation, to study this infernal policy. It belongs to such a prince as you to detest it. This art, which may be classed with that of the Locustes and the Brinvilliers, may give to some tyrants a temporary sway, just as poison may procure an inheritance; but most assuredly it has never made men either great or happy. What, then, can any one accomplish by pursuing this frightful policy? Nothing but misery to others, and also to himself. These are the truths which should form the catechism of your exalted soul." On the 26th of June 1739, the prince replies to this flattering homage in the true French style, by informing his correspondent that what he meditates against Machiavelism is properly a continuation of the Henriade. "It is out of the noble sentiments of Henri IV." says he, "that I am forging the thunderbolt which will crush Cesare Borgia." On the 27th of December, Voltaire renders homage for homage. "We shall at length," says he, "have a book worthy of a prince; and I doubt not that an edition of Machiavel, with this counter-poison at the end of each chapter, will be one of the most precious monuments of literature." "The *Anti-Machiavel*," he adds, "ought to become the catechism of kings, and of their ministers." The book which, in this commerce of flattery, Voltaire denominates *Anti-Machiavel*, is the *Examen du Prince de Machiavel*, by the prince-royal, afterwards king of Prussia, who, in his preface, declares that "he always looked upon the *Prince* as one of the most dangerous works that ever was published," though he afterwards lived long enough to find some of its maxims more convenient and agreeable than he had at first anticipated.

It would be equally endless and impertinent to relate the host of criticisms and apologies, of accusations and defences, of which Machiavelli has been the object, in almost all the languages of Europe. But we shall cite the authority of a judge whom it will not be easy to refute; we mean that of the Florentine secretary himself. Before finishing his treatise of the *Prince*, he wrote to one of his friends, Francisco Vettori, a letter, which discloses without any reserve his real position and his motives, and thus puts an end to all speculation upon the subject. This letter, found in the Barberini library at Rome, was published for the first time by Angelo Ridolfi, in a work entitled *Pensieri intorno allo scopo di Nicolo Machiavello nel libro Il Principe*, Milan, 1810; and Ginguené has also cited it in his *Histoire Littéraire d'Italie*, though, for some reason, he has divided it into two parts, giving the one half in the text, and the other half in a note. The first part contains details which may perhaps be considered as ignoble, but which nevertheless make known the peculiar cast of character, as well as the patience, of the author; the second shows him in all the dignity of his talent. We shall only cite the portion which has immediate reference to the subject before us.

"On the approach of evening," says he, continuing the description of his habits and mode of life, "I retire to my dwelling, and enter my cabinet; at the door I divest myself of my peasant's garb, bedaubed with mud and dirt, put on proper attire, and thus decently dressed I enter the ancient courts of men of old. Being well received by them, I fill myself with that nourishment which alone agrees with me, and for which I was born; nor do I hesitate to converse with them, and to inquire the motives of their actions; whilst they, on the other hand, being full of humanity, reply to my inquiries. For four hours I experience no weariness; I forget all sorrow; I have no dread of poverty, and death no longer alarms me; I transport myself entirely to them; and, as Dante says that *there will never be science unless we retain what we have learned*, I have noted down the substance of my conversation with them, and composed a work, *De Principatibus*, in which I enter as deeply as I can into this subject, with a view to fathom it. I examine what a principality is; how many kinds there are of them; how they are acquired, how maintained, how lost; and if ever any trifle (*ghiribizzo*) of mine gave you pleasure, this should not displease you. It should also be acceptable to a prince, more especially to a new one; wherefore I address it to the magnificent Julius.[1] Philip Casavecchia has seen my treatise, and can inform you in detail of the subject itself, and the arguments I have had with him; and as to myself, I am now occupied in extending and correcting it. You wish that I should abandon my actual mode of life, and go to enjoy yours; I will do so gladly; but I am prevented at present by some affairs which will be settled in about six weeks. The only thing which makes me hesitate is, that, near these Soderini, I shall be obliged, on my arrival, to visit and to speak with them. I am also apprehensive that, upon my return, instead of stopping at my own house, they would make me alight at the barigel (prison); for although this state stands on solid foundations, and enjoys great security, still it is new, and consequently suspicious; nor are there wanting meddling intriguers (*saccenti*), who, like Paul Bertini, would run up a long score, and leave me to pay the reckoning. I beseech you to save me from this danger, and I will by all means come to you at the time I have mentioned. I have been talking with Philip about my little work (the *Prince*), and I have asked him whether it would be proper to give it to the world or not, and, in the event of its being expedient to do so, whether I should bring it myself or send it to you. Were it not published, it is doubtful whether it would ever be read by Julius, and Ardinghelli[2] would reap the honour of this the last of my works. *The necessity which pursues me, however, urges me to give it, because I am wasting away, and cannot long remain thus without becoming contemptible through poverty. My wish is, that these Medici would begin to employ me, were it only at first to roll a stone.* If I did not then gain their good will, I would have myself only to blame; and by this production, if it be read, people will see that, during the fifteen years I passed in studying the art of government, I have not been a careless or inattentive observer; besides, every one should be eager to employ a man who has acquired experience at the expense of others. Of my fidelity no doubt can reasonably be entertained, because, having always acted with good faith, I am not likely now to sacrifice my character. He who has been faithful and good forty-three years, which is my present age, cannot change his nature. *My indigence sufficiently attests my fidelity and uprightness.*"

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[1] The subject of this *novella piaccevolissima* cannot be better described than in the words of the argument prefixed: "Befagor arcidiavolo è mandato da Plutone in questo mondo, con obligo di dover prender moglie. Ci viene, la prende; e non potendo sofferire la superbia di lei, ama meglio retornarsi in Inferno, che ricongiugnersi seco." Ben Jonson, in the plot of *The Devil is an Ass*, appears to have taken some hints from this tale, with others from Boccacio.

[2] "Out of his surname," says a writer in the *Edinburgh Review* (vol. xlv. p. 260), "they coined an epithet for a knave, and out of his Christian name a synonyme for the devil." For the latter point, the writer has the authority of Hudibras (part iii. canto i.).

Nick Machiavel had ne'er a trick,
Though he gave his name to our Old Nick.

But on this subject the antiquarians, we believe, are by no means agreed.

[3] See preface to the French edition of 1813.

This letter requires no explanation or commentary. In it Machiavelli lays bare his whole soul, disclosing without reserve his vexation, his dread of misery, the shame with which he regarded the almost disgusting situation to which he had been reduced, and his desire at any sacrifice to be again employed in public affairs; nor will the attentive observer, who reads it with care, fail to discover in it a key to the treatise of the *Principe*. Indeed the Italian writers no longer judge of that work without referring to the letter addressed to Vettori.[3] It has been said that Machiavelli, despairing of the liberty of Florence, was inclined to support any government which might secure its independence. But this is a refinement wholly unsupported by evidence. The motive which impelled him to the composition of the work was actual indigence, and the prospect of still greater misery; the object which he sought to attain by it was immediate employment under the new masters of Florence, were it only in the first instance to roll a stone. None of the designs which have been so freely imagined, and so confidently ascribed to the fallen secretary, seems ever to have entered his mind. He wanted bread, and thinking that his book, containing the results of his experience and observation, would be acceptable to a prince, especially a new one, he tenders it through Vettori, in the hope that it might be instrumental in saving him from that destitution, the prospect of which he contemplated with so much horror. It is also to be observed that the book, when first published, did not appear to the Italians in the light in which it was afterwards regarded. This is sufficiently evident from the fact that it was printed in virtue of a privilege granted by Pope Clement VII., dated the 23d of August 1531. Italy was then abandoned to such disorders, that some sovereigns hoped to find useful counsels, where, in point of sound morality, they could meet with nothing but odious precepts. At the same time, if we separate the author from his work, it may be observed, that Machiavelli could not know that his work would ever be published. He composed it in the form of a memoir to Lorenzo de' Medici; and in his dedication to that young prince, he tells him that he has nothing to offer him but the knowledge of the actions of great men, which he had acquired by long experience in modern affairs; and at the close he adds, "If your magnificence, from the elevated station you occupy, would deign to cast an eye on this lower region, you would learn how unjustly I suffer under the great and continual malignity of fortune."[4]

With regard to the general character of Machiavelli as a writer, and also to the particular question, whether the treatise of the *Prince* was a serious production, or, as Bacon seems to suggest,[5] merely a piece of grave irony, intended to put nations on their guard against the arts of new and ambitious princes, we refer the reader to the judicious and discriminating remarks upon both points, contained in the First Preliminary Dissertation (pp. 32–37). The *Prince* is an account of the means by which tyrannical power is to be acquired and preserved; it is a theory of that class of phenomena in the history of mankind. Hence it is essential to its purpose that it should contain an enumeration and exposition of tyrannical arts; and on this account it may not only be viewed, but used, as a manual of such arts. A philosophical treatise on poisons would, in like manner, determine the quantity of each poisonous substance capable of producing death, the circumstances favourable or adverse to its operation, and every other information essential to the purpose of the poisoner, though not intended for his use. But the general utility of such a work is, nevertheless, indisputable; and it is also plain, that a calm unvarnished exposition of tyrannical arts is the bitterest satire against them. Of this Machiavelli himself seems to have been fully aware, when he observed, in reply to a remark which had been made upon this very work, that if he had taught princes to be tyrants, he had also taught the people to destroy tyrants. The *Prince* must, therefore, have had the double aspect here pointed out, though neither of the objects thereby indicated had actually been in the contemplation of the author. It may not be the object of the chemist to teach the means of exhibiting antidotes, any more than of administering poisons; but his pupils or readers may employ his discoveries for both objects. Aristotle had long before given a similar theory of tyranny, but without the suspicion of an immoral intention; nor was it any novelty, in more recent times, amongst those who must have been the first teachers of Machiavelli. The schoolmen followed the footsteps of Aristotle too closely to omit so striking a passage as that to which we have alluded (*Politic.* lib. v. c. 3); and, in fact, Aquinas explains it in his commentary, like the rest, with most unsuspecting simplicity. To us, accordingly, the plan of Machiavelli, like those of former writers, appears to have been purely scientific; and so Lord Bacon seems to have understood him, where he gives him thanks for exposing openly, and without reserve, what princes actually do, not what they ought to do. Great defects of character are no doubt manifested by the writings of Machiavelli. But if a man of so powerful a genius had shown a mind utterly depraved, it would have been a painful and perhaps solitary exception to the laws of human nature; and certainly no depravity can be conceived greater than a deliberate intention to teach perfidy and cruelty. That a man who was a warm lover of his country, who underwent cruel sufferings for her liberty, and who was esteemed by the very best of his countrymen (*e. g.* Guicciardini, his political opponent), should fall into such unparalleled wickedness, may be considered as wholly incredible. The author of the *Prince*, according to the common notion of its intention, could never have inspired such sentiments, had he been a man steeped in depravity, and devoid of all virtuous feeling. To possess the power, however, of contemplating tyranny with scientific coldness, and of rendering it the mere subject of theoretical speculation, must be owned to indicate a defect of moral sensibility. But, to say nothing of the political maxims then received, and of the lenity with which the Italians regarded those crimes which required self-command, address, quick observation, fertile invention, and profound knowledge of human nature, the *Prince* was obviously wrung from the author by the pressure of severe distress; and it is more than probable, that, but for his misfortunes, this famous treatise would never have seen the light.[1]

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[1] In point of fact, it is dedicated to the young Lorenzo de' Medici, duke of Urbino, and brother-in-law of Strozzi.

[2] Nicolas Ardinghelli, distinguished for his acquirements in Greek and Roman literature, died a cardinal at Rome in 1547.

[3] On this question, and on other important points relative to Machiavelli, the reader may consult the excellent dissertation of the Chevalier Baldelli.

[4] Et se vostra Magnificenza dallo apice della sua Altezza, qualche volta volgerà gli occhi in questi luoghi bassi, conoscerà quanto indegnamente io sopporti una grande e continua malignità di Fortuna."

[5] "Est quod gratias agamus Machiavello et hujusmodi scriptoribus, qui aperte et indissimulanter proferunt quid homines facere soleant, non quid debeant." (*De Augment. Scient.* lib. viii. c. 2.)

The most ample and esteemed edition of the works of Machiavelli is that of 1813, *Italia* (Florence), in eight vols. 8vo. The best of the French translations is that of Giraudet and Hochet, Paris, 1799, in nine vols. 8vo. Those of Gohorry, Paris, 1571 and 1635, of the Sieur de Briencour, Rouen (Paris), 1669, and of Tétard, Hague, 1691–1696, reprinted in 1743, were very incomplete. The only English translation to which we have had access is that of Farneworth, London, 1762, in two vols. 4to, which is overloaded with a great deal of rubbish that might well have been spared, and is, besides, defective in several respects, particularly in regard to the life of the author, and some of his minor productions. (A.)

MACHINE, *Machina*, in general signifies any thing that serves to augment or to regulate moving powers; or it is any body destined to produce motion, so as to save either time or force. The word comes from the Greek *μαχανη*, *machine*, *invention*, *art*; and hence, in strictness, a machine is something that consists more in art and invention than in the strength and solidity of the materials, for which reason inventors of machines are called *ingénieurs*, or *engineers*. Machines are either simple or compound. The simple ones are the seven mechanical powers, namely, the lever, balance, pulley, axis and wheel, wedge, screw, and inclined plane. See MECHANICS.

MACHINERY, in epic and dramatic poetry, is when the poet introduces some supernatural being into the scene, in order to solve some difficulty, or to perform some exploit out of the reach of human power. The ancient dramatic poets never made use of machinery, unless where there was an absolute necessity for so doing. It is quite otherwise with epic poets, who introduce machinery in every part of their poems; so that nothing is done without the intervention of the gods. In Milton's *Paradise Lost*, by far the greater part of the actors are supernatural personages. Homer and Virgil do nothing without them; and, in Voltaire's *Henriade*, the poet has made excellent use of St Louis.

MACHTEBETE, a town of the Netherlands, in the province of East Flanders and circle of Ghent, situated on the Moerdeke-Baert, containing 3350 inhabitants.

MACHUL, a musical instrument amongst the Hebrews. Kircher apprehends that this name was given to two kinds of instruments, one of the stringed, and the other of the pulsatile kind. That of the former sort had six chords; but there is great reason to doubt whether an instrument requiring the aid of the hair-bow, and so much resembling the violin, be as ancient as this would imply. The second kind was of a circular form, made of metal, and either hung round with little bells, or furnished with iron rings suspended on a rod or bar which passed across the circle. Kircher supposes that it was moved to and fro by a handle fixed to it, and thus emitted a melancholy kind of murmur.

MACHYNLETH, a market-town of Wales, in the county of Montgomery and hundred of its own name, 200 miles from London. It stands on the river Dyvy. It is a neat, well-built town, and very ancient, being the place where Owen Glendower assembled his parliament, and exercised other acts of regality, in the year 1402. The market is held on Monday. It is an ancient borough, and, in conjunction with Llanidloes, Llanvilling, Welshpool, and Newton, returns one member to parliament. The population amounted in 1801 to 1118, in 1811 to 1252, in 1821 to 1595, and in 1831 to 1625.

MACKENHEIM, a town of the circle of Rheinbach, in the Prussian government of Cologne, situated on the river Erft, containing 200 houses and 1260 inhabitants.

MACKENZIE, SIR GEORGE, a learned writer and eminent lawyer of Scotland, was the grandson of Kenneth, first Lord Mackenzie of Kintail, and the nephew of Colin and George, first and second Earls of Seaforth. He was born at Dundee in 1636; and after passing through the usual course of education in his own country, he was sent to the university of Bourges, at that time denominated the Athens of lawyers, where he remained three years. Young Scotchmen intended for the bar, having no sufficient means of instruction in the Roman law at home, were then accustomed to frequent the university of Bourges, as in later times they repaired to those of Utrecht and Leyden. He was called to the bar in the year 1656, and had risen into considerable practice before the Restoration. In a sketch of an eminent advocate of that day, he has recorded his contempt for the canting tone which then prevailed in the courts of law, and to which even the most learned advocates, whatever their own inclinations might have been, were obliged to conform.[1] Immediately after the Restoration he was appointed one of the justices-depute, criminal judges who exercised that jurisdiction which was soon afterwards vested in five lords of sessions, under the denomination of commissioners of justiciary; and, in 1661, he and his colleagues were ordained by the parliament " to repair, once in the week at least, to Musselburgh and Dalkeith, and to try and judge such persons as are ther or therabouts delate of witchcraft ;" so much more urgent did they deem the punishment of that imaginary offence than of any other crime, however aggravated.

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[1] See *Edinburgh Review*, vol. xxvii. pp. 213, 214.

Mackenzie's name appears in the parliamentary proceedings as counsel in almost every cause of importance; and his connection in that character with the Marquis of Argyll gives no small weight to a passage in his *Memoirs*, respecting a circumstance in the trial of that nobleman, which has been the subject of much historical controversy. Between the years 1663 and 1667 he was knighted. He represented the county of Ross during the four sessions of the parliament which was called in 1669. In 1667, he had been appointed lord advocate in the room of Sir John Nisbet, whom he describes, in one place, as " a person of deep and universal learning," and of whom, in another, he says, that " in the conduct of causes he displayed the greatest learning and consummate eloquence."[2] By that preferment he was, unhappily for his character, implicated in all the worst acts of the Scotch administration of Charles II.; a system of misgovernment which has only had one parallel in the European portion of the British dominions. Having betrayed some repugnance, however, to concur in those measures which openly and directly led to the re-establishment of popery, he was removed from his office in 1686, and (which is not a little remarkable) reinstated in 1688, when such measures were still more avowedly pursued.

At the Revolution he adhered to the fortunes of his royal master. Being elected a member of the convention, he supported the pretensions of King James with courage and ability, against Sir John Dalrymple and Sir James Montgomery, who were the most considerable speakers of the Revolution party; and remaining in his place even after the imprisonment of Balcarras and the escape of Dundee, he was one of the minority of five in the memorable division respecting the forfeiture of the crown.[3] King William had been solicited, by some eager partisans, to declare Mackenzie and a few others incapable of holding any public office; but he refused to accede to the proposal, in conformity to the maxims of that wise policy, which uniformly induced him not to concur in those measures, even of just retribution, which, at moments of violent internal change, are so apt to degenerate into proscription and revenge. At this critical juncture, when the crown, which one king was declared to have forfeited, was placed on the head of another, and when his own fortunes were in jeopardy, Sir George Mackenzie composed and delivered his inaugural address on the foundation of the library of the Faculty of Advocates; a circumstance evincing no inconsiderable degree of firmness and intrepidity. When the death of Dundee destroyed the hopes of his party in Scotland, he took refuge in Oxford, the natural asylum of so learned and inveterate a Tory. But, under the tolerant government of King William, he appears to have enjoyed, in perfect security, his ample fortune, the fruit of his professional labours. In Evelyn's Diary (9th March 1690), we have an account of the freedom which he indulged in conversation at the table of a prelate who was a zealous supporter of the new government. " I dined," says he, " at the Bishop of St Asaph's, almoner to the new queen, with the famous lawyer Sir G. Mackenzie (late lord advocate of Scotland), against whom both the bishop and myself had written and published books, both now most friendly reconciled. He related to us many particulars of Scotland, the present sad condition of it, the inveterate hatred which the presbyterians show to the family of the Stewarts, and the exceeding tyranny of those bigots, who acknowledge no superior on earth in civil or divine matters, maintaining that the people only have the right of government, their implacable hatred to the Episcopal order and the Church of England. He observed, that the first presbyter dissents from our discipline were introduced by the Jesuits about the twentieth of Elizabeth; a famous Jesuit among them feigning himself a Protestant, and who was the first who began to pray extempory, and brought in that which they since called, and are still so fond of, praying by the Spirit."[4]

In the spring of 1691, Sir George Mackenzie went to London, where he contracted a disorder which carried him off. He died in St James's Street, on the 2d of May 1691; and his death is mentioned as that of an extraordinary person, by several of those who recorded the events of their time. His body was conveyed by land to Scotland, and interred with great pomp and splendour in Edinburgh; a circumstance which shows how little the administration of William was disposed to discourage the funeral honours paid to its most inflexible opponents. It may also be mentioned, to the honour of the government, that, whilst the censorship of the press still subsisted, he was allowed to publish his Vindication of the Government of Scotland under Charles II.; a very inadequate defence, it must be owned, but one, nevertheless, which a new prince, opposed by a powerful party in the state, had some reason to dread.

The writings of Sir George Mackenzie are literary, legal, and political. His Miscellaneous Essays, both in prose and verse, may now be dispensed with, or laid aside, without difficulty. They have not vigour enough for long life; but, considered as the elegant amusements of a statesman and lawyer, they afford evidence of the refinement of his taste and the variety of his accomplishments. In several of his moral essays, both the subject and the manner betray an imitation of Cowley, who was at that moment commencing the reformation of English style. Like his master, he wrote in praise of solitude; and Evelyn, in a confidential letter to Cowley, highly commends his merits as a writer. Nor would it be just to the memory of Mackenzie to refrain from mentioning the extraordinary praise bestowed on him by Dryden, the successor, but scarcely the superior, of Cowley, in English prose.

Sir George Mackenzie is one of the few British advocates who have published their speeches delivered at the bar. In Scotland these are often called " pleadings," and in England " arguments," when addressed to the judges on matters of law; but they retain the general name of " speeches" when addressed to a jury, or to any other popular body.

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[1] " Nicholsonus junior eloquio usus est fanatico non Romano; et hinc concionabatur potius quam orabat: documentum posteris futurus, illud ad persuadendum aptius quod sæculo, licet sordido, et judicibus, licet hebetioribus placet. Si autem doctus hic orationes posteris transmisisset, Augusti sæculum, illi notissimum, imitatus fuisset." (*Characteres quorundam apud Scotos Advocator.*)

[2] See *Memoirs*, p. 324. " Qui summa doctrina consummataque eloquentia causas orabat." (*Characteres quorund. Advocat.*)

[3] Balcarras *Memoirs*, in MS.

[4] Evelyn's *Memoirs*, vol. ii. p. 19. The absurd fictions, so gravely reported in the above extract, seem to countenance the supposition that Sir George Mackenzie, knowing his men, had been making an experiment on their credulity, and hoaxing both the bishop and Evelyn. It is wonderful indeed that he did not represent John Knox as a disguised jesuit.

Mackenzie's speeches evince considerable knowledge, ingenuity, and address, and are never very defective except in those passages which aim at eloquence. In the speech before the parliament for the Marquis of Argyll, the question, whether passive compliance in public rebellion be punishable as treason, is treated with no small ability.

His work on the Laws and Customs of Scotland in Matters Criminal was published in 1678, and is dedicated to the Duke of Lauderdale, to whom the author says, "You are yourself the greatest statesman in Europe who is a scholar, and the greatest scholar who is a statesman. You are the man who spends the one half of the day studying what is just, and the other half in practising what is so!" At that time the government of Scotland had no reason to complain of the want of base compliance in juries, not one of which, during the eighteen years that had elapsed since the Restoration, had ventured to rescue a single victim, however innocent, from the clutches of power. But, even in the midst of this apparent security, the acuteness of the Lord Advocate discovered the possibility that independent juries might one day arise; he augured integrity at a distance, scenting the approach of liberty in every refreshing gale; and hence, in the work just named, he openly proposes the abolition of juries in criminal causes.[1] His reasonings are ingenious and plausible. He tells us, that "now, when law is formed into a science, and that judges are presumed to be learned and assizers not, it seems reasonable they should be suppreſt, as well in criminal cases as they already are in civil." The great and paramount benefit of juries in criminal cases, namely, their power of shielding innocent and virtuous men against the vengeance of power, is kept entirely out of view, though doubtless it formed the sole motive for the project.

The works of Sir George Mackenzie were published at Edinburgh in two volumes folio, in 1716 and 1722. In the second volume there appears the following advertisement: "Whereas in the list of the author's manuscripts there is mention made of an History of the Affairs of Scotland from the Restauration of King Charles II. 1660, to the [year] 1691, which subscribers might have readily looked for in this second volume; but that manuscript being in the hands of some of the author's relations, who think it not ready for the press until it be carefully revised, they have reckoned it more proper to have it printed by way of Appendix to this second volume, how soon they have it revised and transcribed by a good hand." For many years the History thus announced was supposed either to have perished or to have been intentionally destroyed. The second Earl of Bute, who supported the government of the House of Hanover, and had married the sister of John duke of Argyll, the leader of the Whig party in Scotland, enjoyed, in the year 1722, and probably possessed, his papers. It was not unnatural, therefore, that he should be suspected, at that juncture, of suppressing such a manuscript, more especially as his family, by conforming to the Revolution, and accepting a title from Queen Anne, had rendered themselves peculiarly obnoxious to the adherents of the House of Stuart. But, however plausible these conjectures may have appeared, they have, in part at least, been proved to be groundless. In the year 1817, a large mass of papers was sold to a shopkeeper in Edinburgh. From these his curiosity led him to select a manuscript volume which appeared to him to be something of an historical nature; and, by another fortunate accident, he communicated it to the late Dr M'Crie, who, on examination, discovered that it was the composition of Sir George Mackenzie, and formed part of that history of his own times which had so long been a desideratum in Scottish literature. Of this the evidence was both obvious and complete; for the manuscript, though written by one of the ordinary transcribers of that age, was decisively identified by numerous corrections and additions in the well-known handwriting of Sir George Mackenzie himself. The curious fragment of Scottish history, thus happily recovered, was published at Edinburgh in 1821, 4to, under the editorial superintendence of Mr Thomas Thomson, who, in an able and well-written preface, has related the singular circumstances in which the manuscript was rescued from destruction. It is to be regretted, however, that the portion thus published ends at the very time when the author's means of information became more ample. For many reasons, it would be highly desirable to possess the sequel of these Memoirs.[2] (A.)

MACKENZIE, *Henry*, was born at Edinburgh, in August 1745. His father, Dr Joshua Mackenzie, was an eminent physician of Edinburgh, the author of a volume of Medical and Literary Essays; his mother was the eldest daughter of Mr Rose of Kilravock, of an ancient family in Nairnshire.

After being educated at the High School and University of Edinburgh, Mr Mackenzie was articled to Mr Inglis of Redhall, to qualify him for exchequer business. In 1765 he went to London to study the modes of English exchequer practice. Whilst there, his talents induced a friend to solicit his remaining in London to qualify himself for the English bar; but the wishes of his family, and the moderation of his own unambitious mind, decided his return to Edinburgh; and there he became, first partner of, and afterwards successor to, Mr Inglis, in the office of attorney for the crown. When in London, he sketched some part of his first and very popular work, *The Man of Feeling*, which was published anonymously in 1771. The great popularity of this volume gave occasion to a remarkable fraud on the part of a Mr Eccles of Bath, who, taking advantage of the book being anonymous, laid claim to the authorship, transcribed the whole in his own hand, with interlineations and corrections, and maintained his right with such plausible pertinacity, that Messrs Cadell and Strahan, Mr Mackenzie's publishers, found it necessary to undeceive the public by a formal contradiction. The *Man of the World* was published a few years after the *Man of Feeling*, and breathes the same tone of exquisite sensibility. In his first publication he imagined a hero constantly obedient to every emotion of his moral sense. In the *Man of the World* he exhibited, on the contrary, a person rushing headlong into vice and ruin, and spreading misery all around him, by grasping at happiness in defiance of the moral sense. His next production was *Julia de Roubigné*, a novel in a series of letters. The fable is very interesting, and the letters are written with great elegance and propriety of style. In 1777 or 1778, a society of gentlemen in Edinburgh, mostly lawyers, projected the publication of a series of papers on morals, manners, taste, and literature, similar to those of the *Spectator*. This society, originally designated The Tabernacle, but afterwards The Mirror Club, consisted of Mr Mackenzie, Mr Craig, Mr Cullen, Mr Bannatyne, Mr Macleod, Mr Abercrombie, Mr Solicitor-General Blair, Mr George Home, and Mr George Ogilvie, several of whom afterwards became judges in the Supreme Courts of Scotland. Their scheme was speedily carried into effect, and the papers, under the title of the *Mirror*, of which Mr Mackenzie was the editor, were published in weekly numbers, at the price of threepence per folio sheet. The sale never reached beyond three or four hundred in single papers; but the whole, with the names of the respective authors, were republished in three duodecimo volumes. From the price of the copyright, the writers presented a donation of L.100 to the Orphan Hospital, and purchased a hogshead of claret for the use of the club. To the *Mirror* succeeded the *Lounger*, a periodical of a similar character, and equally successful. Mr Mackenzie was the most valuable contributor to both these works. His papers are distinguished from all the rest by that sweetness and beauty of style, and tenderness of feeling, which form the peculiar character of his writings. In the *Lounger* Mr Mackenzie was the first to appreciate the genius of Burns, in a review of his poems, then recently published, which at once drew the unknown poet from obscurity into the full blaze of a fame that will never die. On the institution of the Royal Society of Edinburgh, Mr Mackenzie became one of its members; and amongst the papers with which he enriched the volumes of its Transactions are, an elegant tribute to the memory of his friend Judge Abercrombie, and a memoir on German Tragedy, the latter of which bestows high praise on the *Emilia Galotti* of Lessing, and on the *Robbers* by Schiller. Whilst prosecuting his study of German literature, he was induced to publish, in the year 1791, a small volume containing translations of the Set of Horses by Lessing, and of two or three other dramatic pieces. Mr Mackenzie was one of the original members of the Highland Society, and wrote the accounts of the institution and principal proceedings of the society which appear in their Transactions. In the Transactions of the same society he published a view of the controversy respecting the poems of Ossian, in which he attempted to vindicate their authenticity; and in the same paper gave a spirited and interesting account of Gaelic poetry. In 1793 he wrote the Life of Dr Blacklock, prefixed to the quarto edition of the works of the blind poet. In 1812 he read to the Royal Society a memoir of John Home, in which he gives a sketch of the literary society of Edinburgh during the latter part of the last century, with the great ornaments of which he lived in habits of friendly intercourse.

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[1] Part ii. title 23, of Assizes.

[2] See *Edinburgh Review*, vol. xxxvi. p. 1, *et seq.* from which the foregoing notice is almost exclusively derived.

Mr Mackenzie was not so fortunate as a writer of dramas. Several of his plays were brought out at different theatres, but, though possessed of considerable merit as literary productions, they were not successful on the stage. He wrote several political tracts, which procured him the countenance and respect of Mr Pitt, and other illustrious statesmen of his time. Mr Mackenzie was not more distinguished by the wit with which he enlivened a numerous circle of attached friends, than the benevolence and wisdom with which he counselled and assisted them. This ornament of his native city died at Edinburgh, at an advanced age, rather from the decay of nature than from disease, on the 14th of January 1831.

A complete edition of his works was published at Edinburgh, in eight volumes 8vo, in 1808.

MACKINTOSH, THE RIGHT HONOURABLE SIR JAMES, one of the most distinguished men of his time, and who attained to great eminence in literature, philosophy, history, and politics, was born at Aldourie, on the banks of Loch Ness, Scotland, on the 24th of October 1765. His father, Captain John Mackintosh, was the representative of a family which had for above two centuries possessed a small estate called Kellachie, in Inverness-shire. He had served long in the army, which he entered very young, and had been severely wounded at the battle of Felinghausen, in the Seven Years' War. His mother was Marjory Macgillivray, daughter of Mr Alexander Macgillivray by Anne Fraser, sister of Brigadier-General Fraser, who was killed in General Burgoyne's army in 1777. His father joined his regiment at Antigua soon after his birth, and remained in that island and in Dublin for eight or nine years. He was reared with great care and tenderness by his mother, notwithstanding the anxiety and discomfort incident to the condition of one who had no available resources of her own. His father, a subaltern and younger brother, found his pay not too much for his own expenses; and all the kindness of his mother's family could not relieve the mind of that lady from the painful, not to say humiliating, sense of dependence. This probably contributed to the extreme affection which she cherished for her child. He depended upon her alone; and as there is nothing which so much lightens the burden of receiving benefits as the pleasure of conferring them, she loved him "with that fondness which we are naturally disposed to cherish for the companion of our poverty."

In the summer of 1775, young Mackintosh was sent to school at the town of Fortrose, where he was placed under a master of the name of Smith. In a short memoir of this early period of his life, he says, "I have little recollection of the first two years at school;" but he had scarcely learned to read when he evinced that predilection for abstract speculation which afterwards formed so prominent a feature of his intellectual character. A gentleman of the name of Mackenzie having lent him Burnet's Commentary on the Thirty-nine Articles, he perused it with great avidity; "and I have now," says he, writing many years afterwards, "a distinct recollection of the great impression which it made." But the part which struck him most forcibly, and which he read with peculiar eagerness and pleasure, was the commentary on the seventeenth article, which relates to predestination; a strange subject to engage the attention and interest the understanding of a mere boy. "I remember," says he, "Mr Mackenzie pointing out to me, that though the bishop abstained from giving his own opinion on that subject in the commentary, he had intimated that opinion not obscurely in the preface, when he says that 'he was of the opinion of the Greek church, from which St Austin departed.'" He was of course profoundly ignorant of what the Greek church was, and knew nothing of St Austin's deviations; but the mysterious magnificence of this phrase had an extraordinary effect upon his imagination. His mind appears to have revolted at the doctrine of eternal decrees of election and reprobation; though surrounded by orthodox Calvinists, he became a warm advocate for free will; and before he had completed his fourteenth year, he was probably the boldest heretic in the county. About the same time he read the old translation of Plutarch's Lives, and Echard's Roman History, which led him into "a ridiculous habit," which afterwards clung to him, of building castles in the air. During his vacations, which he spent at his grandmother's house, he read such books as fell in his way, and amongst these the works of Pope and Swift. His first poetical attempt was a pastoral or elegy on the death of his uncle Brigadier-General Fraser, who fell on the 7th of October 1777; but in 1779 and 1780 his muse was exceedingly prolific, and he even commenced an epic poem on the defence of Cyprus by Evagoras, king of Salamis, against the Persian army.

In October 1780 he went to college at Aberdeen, where he remained during that and the three following sessions. On entering King's College, he was admitted into the Greek class, then taught by Mr Leslie, who, however, did not attempt to do more than teach the first rudiments of the language. The second winter, according to the scheme of education then pursued, he fell under the tuition of Mr Dunbar,[1] and remained under the care of this gentleman until he left college. At Aberdeen he was by common consent recognised as *inter studiosos facile princeps;* whilst his courteous demeanour, refined manners, playful fancy, and easy flow of elocution, rendered him a general favourite amongst his companions. His chief associate at King's College was the late Reverend Robert Hall, whom the exclusive system of the English universities had forced to seek, in this northern seminary, for that academical education which was denied to him, as a dissenter, in his own country. Like Castor and Pollux, these young men were assimilated in the minds of all who knew them, by reason of the equal splendour of their talents, although in other respects they were extremely unlike. They were of the same intellectual stature, but differently moulded; the one being remarkable for gracefulness of manners and symmetry of powers, with much elegance and refinement; the other plainer, and withal less polished, but distinguished for perfect sincerity, ardent piety, and undeviating love of truth. The society and conversation of Hall had great influence on Mackintosh's mind. Their controversies were almost unceasing. Even at this early period, Hall "displayed the same acuteness and brilliancy, the same extraordinary vigour both of understanding and imagination, which have since distinguished him, and which would have secured to him much more of the admiration of the learned and the elegant, if he had not consecrated his genius to the far nobler office of instructing and reforming the poor."

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[1] Author of *Essays on the History of Mankind.*

In the spring of 1784, having previously taken his degree of master of arts, he finally quitted King's College, "with," he says, "but little regular and exact knowledge, but with considerable activity of mind, and boundless literary ambition;" and in the October following he set out for Edinburgh to commence the study of physic, which he had made choice of as a profession. His arrival in that city opened a new world to his mind. Edinburgh was then the residence of many eminent men; of Adam Smith, Dr Black, John Home, Henry Mackenzie, Dr Cullen, Principal Robertson, Dr Ferguson, Dr Hutton, Professor Robison, Mr Dugald Stewart, and others; and although his age did not allow him to be much acquainted with these celebrated persons, yet accident furnished him with opportunities of access to some of them, whilst the concentration of so much genius and talent produced a powerful impression on his ardent and susceptible nature. His speculative turn of mind, however, soon betrayed itself. Within a few weeks after his arrival in Edinburgh, he became a zealous partisan of Brown, who had just become a teacher of medicine, and the founder of a new medical system; and having been elected a member of the Medical Society, he, in a few months, "before he could have distinguished bark from James's powder, or a pleurisy from a dropsy in the chamber of a sick patient," discussed with the utmost fluency and confidence the most difficult questions in the science of medicine. But he had soon an opportunity of displaying his peculiar talents on a theatre better fitted for the exercise of his powers. He was admitted a member of the Speculative Society, which had been established about twenty years before, and, during that period, numbered amongst its members all the distinguished youth in Scotland, besides many foreigners attracted to Edinburgh by the fame of its medical school. In this society, which had general literature and science for its objects, he found some congenial spirits, of whom he has left very graphic sketches, particularly Malcolm Laing the historian, John Wilde, afterwards professor of the civil law in the university of Edinburgh, Benjamin Constant, Adam Gillies, now Lord Gillies, and several other young men, who afterwards rose to eminence or attained distinction in different pursuits. In this exciting atmosphere, speculation rather than study engrossed his attention. Youth, the season of humble diligence and laborious application, was wasted, as he himself complains, in vast, vain, and fruitless projects. Speculators indeed are seldom submissive learners. Those who will make proficiency in useful knowledge, must for a time trust to their teachers, and believe in their superiority; but those who too early think for themselves must sometimes imagine themselves wiser than their masters; and hence docility is often extinguished when the work of education is scarcely commenced. After three years spent in irregular application, he became a candidate for a degree; and having obtained his diploma, he quitted Edinburgh in the month of September 1787, with a large stock of miscellaneous information, acquired by habitual though desultory reading, but without having concentrated his powers upon any one pursuit, or given to professional subjects that systematic and methodical attention which is indispensable to the attainment of professional eminence.

Early in 1788, he set out for London, accompanied by one of his college friends, and arrived on that great theatre of action at a moment sufficiently distracting for one of more advanced age and more settled pursuits. An ardent enthusiast for political amelioration, he came in contact with society when it was already heaving with the first throes of that great convulsion which was soon to overturn all the institutions of a neighbouring country, and to shake those of every other to their lowest foundations. To a young man like Mr Mackintosh, a period of such excitement had irresistible allurements. He had cultivated habits of public speaking, both at Aberdeen and at Edinburgh; he was fond of moral and political controversy, rather perhaps as an exercise of the reasoning powers than with any view to the formation of settled opinions; he found, on the subject of politics, the boldest speculations in which his mind had been engaged, about to receive a practical application; and he longed to mingle in the discussions, if not to take part in the scenes, which distinguished that memorable time. Still his views were, in the first instance at least, directed to the medical profession; and he was led from circumstances to contemplate a medical appointment in Russia. But this project, in which he was supported by Mr Dugald Stewart, did not take effect; and it is probable that he felt but little regret at the failure of a scheme which would have removed him from such a scene of interest and enjoyment as London then presented. In the same year, his father's death freed him from the little control which a soldier of careless and social habits had attempted to exercise over a studious youth; and, as the succession to his paternal estate of Kellachie brought with it but little advantage to his means, his habitual profusion in money matters soon involved him in pecuniary difficulties. His next step was one which seemed but little calculated to diminish them. On the 18th of February 1789, he was privately married to Miss Catharine Stuart, a young lady of a respectable Scotch family; and at the age of twenty-four he found himself with no prospect of any immediate professional settlement, his little fortune rapidly diminishing, and a wife to provide for.

The struggle regarding the regency that followed the announcement of the malady with which the king had been attacked in the autumn of 1788, was the occasion of a pamphlet by Mr Mackintosh, in support of the analogy which Mr Fox endeavoured to establish between the actual state of his majesty and a natural demise of the crown. This seems to have been his first public appearance in the field of politics, for which his mind had now taken a decided turn. About the same time he made the acquaintance of Horne Tooke, whose cause he warmly espoused at the election for Westminster, and in whose rich and lively but sarcastic conversation, he always took great delight. Another effort to establish himself in practice as a physician proved unavailing, probably from his distaste for his profession, and his unwillingness to leave London, which he considered as the grand theatre for talent and ambition. In the autumn of 1789, he made a tour, in company with his wife, through the Low Countries to Brussels; and, upon his return to London, contributed a number of articles on Belgium and France to the *Oracle* newspaper, with which he appears to have been for some time connected. To the same date must be referred his resolution to devote himself to the study of the law. Hitherto the exercise of his powers had been almost exclusively confined to the columns of a newspaper; but although the most successful efforts of ability are often passed unheeded, or make but a feeble and transitory impression where such are neither looked for nor expected, yet this preliminary training was not without its advantage, and the time now approached when he was to appear before the world in a higher and more independent character.

The extraordinary impression produced by the publication of Mr Burke's *Reflections on the French Revolution*, the admiration excited by the work in some quarters, and the vehement indignation with which it was greeted in others, are matters of universal notoriety. By some it was regarded as the most marvellous union of wisdom and genius that had ever appeared in the world, whilst to others it seemed inconsistent with the former life and opinions of the author, notwithstanding that an abhorrence for abstract politics, a predilection for aristocracy, and a dread of innovation, had always been articles of his political creed. The former magnified the sense of public duty which prompted, first the sacrifice of the long-cherished friendship of Mr Fox; and then the publication of what they considered as the earnest admonitions of matured wisdom. The latter, mistaking the real principles of the author, imputed to him an inconsistency with which he was not really chargeable; and, whilst they endeavoured to refute his reasonings and deride his prognostications, branded him as a deserter of the principles he had once professed. The number of antagonists who hurried to break a lance against the champion of existing institutions proved the estimation in which he was held; a multitude of pamphlets appeared, and each shade of opinion was warmly defended against the common enemy of all change. The great majority of these productions, however, soon fell into oblivion. But Paine's *Rights of Man* was not destined to perish so speedily. His strong sense, bold dogmatism, and coarse but vigorous sarcasm, conveyed in a style instinctively popular, made him a dangerous enemy at all times, but more especially at a period when the new principles of liberty had found favour with the people, and when the great masses of the middle and lower orders were to be appealed to in defence of them. But whilst Mr Burke was sustaining the attack of the man who had been his fellow-combatant in the American contest for freedom, " a bolt was shot from amongst the undistinguished crowd, but with a force which showed the vigour of no common arm." The *Vindiciæ Gallicæ* was published in April 1791. It had been finished in a great hurry, but, with all its imperfections and defects, it at once placed the author in the first rank of the party in this country who were upholding the cause of France. He was courted and caressed on all hands, his company was eagerly sought for, and, as he himself expressed it, he was for a few months the lion of the place. In the mean time, the sale of the book exceeded his most sanguine expectations; three editions followed one another with great rapidity; it was quoted in the debates in parliament, eulogised by Mr Fox, and even commended by Mr Burke, for whose genius Mr Mackintosh entertained a chivalrous admiration. In a word, the execution of the work answered every expectation which had been formed of the author; and though he saw occasion afterwards to modify some, if not many, of the opinions expressed in it, yet it is impossible not to acknowledge that it deserved the favour and applause with which it was received by the friends of popular liberty.

In Michaelmas term 1795, Mr Mackintosh was called to the bar, and attached himself to the home circuit. Having thus entered upon a path which, when pursued by the patient steps of genius and industry, so often leads to wealth and distinction, he evidently enjoyed the satisfaction which arises from having in view a constant and honourable occupation. But a severe affliction awaited him in the death of his wife, which took place early in 1797; whilst slowly recovering from the birth of a child, Mrs Mackintosh was attacked by a fever, to which she soon fell a victim, leaving three daughters. In 1799 Mr Mackintosh formed the plan of giving lectures upon the law of nature and of nations. The benchers of Lincoln's Inn granted him the use of their hall, and he commenced his course by an exposition of the general aim and scope of the undertaking, as well as of the views and feelings which had led him to embark in it. In the introductory lecture, after an eloquent vindication of the term " law of nature," and a review of the works of the different masters of the science, exhibiting its progress (in which the character of Grotius is delineated in a manner worthy of his great learning and genius), the subject is marked out into six great divisions, viz. *first*, an analysis of the nature and operations of the human mind; *secondly*, the relative duties of private life; *thirdly*, the relations of subject and sovereign, citizen and magistrate, the foundation of political liberty and political rights; *fourthly*, the municipal law, civil and criminal, exemplified by the progress of the codes of Rome and of England; *fifthly*, the law of nations strictly so called, or the science which regulates the application of the sanctions of private morality to the great commonwealth of nations; and, *lastly*, a survey of the diplomatic and conventional law of Europe. This discourse, which the lecturer was induced to publish, had no sooner issued from the press than commendations poured in upon him from every quarter. Mr Pitt, Lord Loughborough, Dr Parr, and others, united their suffrages in its praise; and it must be confessed, that if Mackintosh had published nothing else than this discourse, he would have left a striking monument of his intellectual strength and symmetry. His political opinions, indeed, had undergone a considerable change, and as the tone of these lectures differed materially from that of the *Vindiciæ Gallicæ*, and of the *Letter to Mr Pitt*, this circumstance, together with the support ostentatiously given to them by the ministers of the day and their connections, served to alienate from him several of his old political friends, and to beget suspicions for which there existed no solid foundation. At the same time, it may be conjectured that the friendship and correspondence of Mr Burke, and the warm commendations of Mr Pitt, may have unconsciously had some influence on his mind; and that the change to which we have alluded, and which he himself was too honest not to acknowledge, may not be altogether imputable to horror at the excesses which disgraced the cause of liberty in France, and disappointment at not seeing it established so speedily and purely as he had anticipated.

We come now to an event of great importance in the life of Mr Mackintosh; we mean the trial of M. Peltier, an emigrant royalist, for a libel on the First Consul of France. The circumstances which led to this memorable trial, the extreme novelty or rather singularity of the case, its immediate connection with the state of political feeling which then prevailed, and the importance which was generally attached to the result, are too well known to require any specification in this place. It is sufficient to observe, that the address delivered by Mr Mackintosh, as counsel for the accused, formed one of the most splendid displays of eloquence ever exhibited in a court of justice, and that it will, beyond all doubt, maintain its place amongst the few efforts of forensic oratory which have survived the occasions that produced them, and are preserved as models for future artists in the same line. "I perfectly approve of the verdict," said Mr, afterwards Lord Erskine; "but the manner in which you opposed it, I shall always consider as one of the most splendid monuments of genius, learning, and eloquence." Similar testimonies of applause were bestowed by other distinguished persons; and it was admitted on all hands, that, by this single effort, Mr Mackintosh had suddenly raised himself to the very highest rank amongst forensic orators. This trial took place on the 21st of February 1803, and, some months afterwards, Mr Mackintosh was appointed to the office of recorder of Bombay, vacant by the death of Sir William Syer. Mr Addington, the first minister of the crown, had been previously made acquainted with Mr Mackintosh's wishes in relation to an appointment in India; and these were now seconded by the friendly zeal of Mr Canning and Mr (afterwards Lord Chief Commissioner) Adam, to whose exertions the appointment must in a great measure be attributed. In taking this step, he was probably influenced by two considerations; first, the comparative ease which it would immediately secure to him; and, secondly, the amount of the salary, which, he believed, might in a few years enable him (as it would if prudence had been amongst the number of his virtues) to accumulate a sum which, in addition to the retired allowance, would render him independent, give him the entire command of his time, and enable him to pursue the course of life best suited to his inclinations. But the hopes of men are often as vain as their calculations are sanguine, and outrun even the consciousness of their own failings. Upon his appointment, he received the customary honour of knighthood, and, early in 1804, sailed with his family for India.

For an account of his life during the eight years which he spent in India, it is only necessary to refer the reader to the Memoirs of his Life, published by his son; a work which, independently of the interest attaching to the principal subject, will be read with instruction and delight on account of the infinite variety of original thoughts and fine observations with which it abounds. His time, indeed, appears to have been divided between the discharge of his judicial duties, literary occupations somewhat irregularly pursued, correspondence with his numerous friends in Europe, and occasional excursions into different parts of the country. The experiment, however, was not successful, in as far as regarded the views which had induced him to solicit the appointment. For, although we now know that his mind was in a state of great vigour and activity during the whole of his residence in India, yet he was not enabled to accomplish, indeed scarcely to commence, any of the great works he had contemplated; whilst his habitual inattention to economy prevented any great improvement in the state of his worldly affairs. The consequence was, that he returned to England in 1812, with broken health and spirits, uncertain prospects, and vast materials for works which were never to be completed.

Mr Percival was now at the head of the government, and, almost immediately on his arrival, endeavoured to secure the support of Sir James, by offering him a seat in parliament, and an early promotion to the head of the Board of Control. These tempting offers, however, he declined, as inconsistent with those principles of liberty "which were then higher in his mind than twenty years before." But he was almost immediately returned on the Whig interest, as member for the county of Nairn. After this, his life scarcely admits of any detailed abstract. He continued in parliament, and true to liberal principles, for the remainder of his days. In 1818, he was appointed professor of law at Hayleybury, and resigned that situation in 1827. He had contemplated a similar appointment at Edinburgh, which, unhappily for the fame of the metropolitan university of Scotland, did not take place. He contributed articles of great value to the *Edinburgh Review;* and in a Preliminary Discourse to this work, being the second in order, furnished by far the best history of ethical philosophy that has ever been given to the world, and which has been reprinted in an octavo size, with a valuable preface by Professor Whewell of Cambridge. To Sir Samuel Romilly, in his exertions for the improvement of the criminal law, he gave the most efficient and zealous support; and, after the death of that virtuous lawyer, became the leader in that most necessary and unexceptionable branch of reform. After printing several volumes of a popular and abridged History of England, which contains more thought and more lessons of wisdom than any other history with which we are acquainted, he left, at his death, the invaluable fragment of the History of the Revolution of 1688, of which a very masterly account will be found in the sixty-second volume of the *Edinburgh Review.* Under Lord Grey's administration, in 1830, he was appointed to a seat at the Board of Control, and cordially co-operated in all the great measures of reform which were then brought forward, and carried after a severe struggle. He died in 1832, regretted with more sincerity, and admired with less envy, than any man of his age. In him, perhaps more than in any man of his time, was exemplified that *mitis sapientia,* which formed the distinguishing attribute of the illustrious friend of Cicero, and which wins its way into the heart, whilst it at once enlightens and satisfies the understanding.

With regard to the intellectual character of Sir James Mackintosh, we cannot do better than quote the words in which the able writer who reviewed the Memoirs of his Life by his son, in that journal to which he was so valuable a contributor, has described, or rather pourtrayed it. "His intellectual character cannot be unknown to any one acquainted with his works, or who has even read many pages of the Memoirs now before us; and it is needless, therefore, to speak here of his great knowledge, the singular union of ingenuity and soundness in his speculations—his perfect candour and temper in discussion—the pure and lofty morality to which he strove to elevate the minds of others, and in his own conduct to conform, or the wise and humane allowance which he was ready, in every case but his own, to make for the infirmities which must always draw down so many from the higher paths of their duty. These merits, we believe, will no longer be denied by any who have heard of his name or looked at his writings. But there were other traits of his intellect, which could only be known to those who were of his acquaintance, and which it is still desirable that the readers of these Memoirs should bear in mind. One of these was that ready and prodigious memory, by which all that he learned seemed to be at once engraved on the proper compartment of his mind, and to present itself at the moment it was required; another, still more remarkable, was the singular maturity and completeness of all his views and opinions, even upon the most abstruse and complicated questions, though raised, without design or preparation, in the casual course of conversation. In this way it happened that the sentiments he delivered had generally the air of recollections—and that few of those with whom he most associated in mature life could recollect of ever catching him in the act of making up his mind in the course of the discussions in which it was his delight to engage them. His conclusions, and the grounds of them, seemed always to have been previously considered and digested; and though he willingly developed his reasons, to secure the assent of his hearers, he uniformly seemed to have been perfectly ready, before the cause was called on, to have delivered the opinion of the court, with a full summary of the arguments and evidence on both sides. In the work before us, we have more peeps into the preparatory deliberations of his great intellect—that scrupulous estimate of the grounds of decision, and that jealous questioning of first impressions, which necessarily precede the formation of all firm and wise opinions,—than could probably be collected from the recollections of all those who had most familiar access to him in society. It was owing perhaps to this vigour and rapidity of intellectual digestion that, though all his life a great talker, there never was a man that talked half so much, who said so little that was either foolish or frivolous; nor any one perhaps who knew so well how to give as much liveliness and poignancy to the most just and even profound observations as others could ever impart to startling extravagance and ludicrous exaggeration. The vast extent of his information, and the natural gaiety of his temper, made him independent of such devices for producing effect, and, joined to the inherent kindness and gentleness of his disposition, made his conversation at once the most instructive and the most generally pleasing that could be imagined."

We cannot deny ourselves the satisfaction of adorning this meagre notice with another citation from the same admirable article, in which the writer replies to and exposes the depreciatory judgment of Mr Coleridge. The passage is severe, but not more so than the occasion and the aggression seemed to require. "In the *Table Talk* of the late Mr Coleridge, we find these words, 'I doubt if Mackintosh ever heartily appreciated an eminently original man. After all his fluency and brilliant erudition, you can rarely carry off anything worth preserving. You might not improperly write upon his forehead, Warehouse to let.' We wish to speak tenderly of a man of genius, and, we believe, of amiable dispositions, who has been so recently removed from his friends and admirers. But so portentous a misjudgment as this, and coming from such a quarter, cannot be passed over without notice. If Sir James Mackintosh had any talent more conspicuous and indisputable than another, it was that of appreciating the merits of eminent and original men. His great learning and singular soundness of judgment enabled him to do this truly; while his kindness of nature, his zeal for human happiness, and his perfect freedom from prejudice and vanity, prompted him, above most other men, to do it heartily. As a proof, we would merely refer our readers to his admirable character of Lord Bacon (*Edinburgh Review*, No. 53, vol. xxvii.). And then, as to his being a person from whose conversation little could be carried away, why, the most characteristic and remarkable thing about it was, that the whole of it might be carried away—it was so lucid, precise, and brilliantly perspicuous. The joke of the 'Warehouse to let' is not, we confess, quite level to our capacities. It can scarcely mean (though that is the most obvious sense) that the head was empty, as that is inconsistent with the rest even of this splenetic delineation. If it was intended to insinuate that it was ready for the indiscriminate reception of anything which any one might choose to put into it, there could not be a more gross misconception, as we have no doubt Mr Coleridge must often have sufficiently experienced. And by whom is this discovery, that Mackintosh's conversation presented nothing that could be carried away, thus confidently announced? Why, by the very individual against whose own oracular and interminable talk the same complaint has been made, by friends and by foes, and with an unanimity unprecedented, for the last forty years. The admiring, or rather idolizing, nephew, who has lately put forth this hopeful specimen of his relics, has recorded in the preface, that 'his conversation at all times required attention; and that the demand on the intellect of the hearer was often very great; and that when he got into his "huge circuit" and large illustrations, most people had lost him, and naturally enough supposed that he had lost himself.' Nay, speaking to this very point, of the ease or difficulty of carrying away any definite notions from what he said, the partial kinsman is pleased to inform us, that, with all his familiarity with the style of his relative, he himself has often gone away, after listening to him for several delightful hours, with divers masses of reasoning in his head, but without being able to perceive what connection they had with each other. 'In such cases,' he adds, 'I have mused, *sometimes even for days afterwards*, upon the words, till at length, spontaneously as it were, the fire would kindle,' &c. And this is the person who is pleased to denounce Sir James Mackintosh as an ordinary man; and especially to object to his conversation, that, though brilliant and fluent, there was rarely anything in it which could be carried away.

"An attack so unjust and so arrogant leads naturally to comparisons which it would be easy to follow out, to the signal discomfiture of the party attacking. But without going beyond what is thus forced upon our notice, we shall only say, that nothing could possibly set the work before us in so favourable a point of view as a comparison between it and the volumes of *Table Talk*, to which we have already made reference—unless, perhaps, it were the contrast of the two minds which are respectively pourtrayed in these publications.

"In these memorials of Sir James Mackintosh, we trace throughout, the workings of a powerful and unclouded intellect, nourished by wholesome learning, raised and instructed by fearless though reverent questionings of the sages of other times (which is the permitted necromancy of the wise), exercised by free discussion with the most distinguished among the living, and made acquainted with its own strength and weakness, not only by a constant intercourse with other powerful minds, but by mixing, with energy and deliberation, in practical business and affairs; and here pouring itself out in a delightful miscellany of elegant criticism, original speculation, and profound practical suggestions on politics, religion, history, and all the greater and the lesser duties, the arts and the elegancies of life—all expressed with a beautiful clearness and tempered dignity—breathing the purest spirit of goodwill to mankind—and brightened not merely by an ardent hope, but an assured faith in their constant advancement in freedom, intelligence, and virtue.

"On all these points, the *Table Talk* of his poetical contemporary appears to us to present a most mortifying contrast; and to render back merely the image of a moody mind, incapable of mastering its own imaginings, and constantly seduced by them, or by a misdirected ambition, to attempt impracticable things—naturally attracted by dim paradoxes rather than lucid truth, and preferring, for the most part, the obscure and neglected parts of learning to those that are useful and clear—marching, in short, at all times, under the exclusive guidance of the Pillar of Smoke—and, like the body of its original followers, wandering all his days in the desert, without ever coming in sight of the promised land." (A.)

MACKLAHSUL, a town of Hindustan, in the province of Berar, and district of Gaungra, on the north side of the Tuptee river, 20 miles north-east from Gawelghur. Long. 77. 34. E. Lat. 21. 64. N.

MACKOOR, a district of Hindustan, in the province of Berar, extending along the river Kaitna, and situated between the 20th and 21st degrees of north latitude. The principal towns are Omerpoor, Shahpoor, and Jaffierabad.

MACKWA, a town of Hindustan, in the Northern Circars, 40 miles west-north-west from Cicacole. Long. 83. 24. E. Lat. 18. 33. N.

MACLAURIN, Colin, a very eminent mathematician and philosopher, was the son of a clergyman, and born at Kilmoddan, Scotland, in 1698. In the year 1709 he was sent to the university of Glasgow, where he continued five years, and applied himself intensely to study. His great genius for mathematical learning discovered itself as early as the age of twelve, when, having accidentally met with an Euclid in a friend's chamber, he became in a few days master of the first six books without any assistance; and it is certain, that in his sixteenth year he had invented many of the propositions which were afterwards published under the title of *Geometria Organica.* In his fifteenth year he took the degree of master of arts, and on that occasion composed and publicly defended, with great applause, a thesis on the power of gravity. After this he quitted the university, and retired to a country-seat of his uncle, who had the care of his education; for his parents had been some time dead. Here he spent two or three years in pursuing his favourite studies; but, in 1717, he offered himself as a candidate for the professorship of mathematics in the Marischal College of Aberdeen, and obtained it after a ten days' trial with a very able competitor. In 1719 he went to London, where he became acquainted with Dr Hoadly, then bishop of Bangor, Dr Clarke, Sir Isaac Newton, and other eminent men, at which time also he was admitted a member of the Royal Society; and in another journey in 1721, he contracted an intimacy with Martin Folkes, the president of the society, which continued until his death.

In 1722, Lord Polwarth, plenipotentiary of the king of Great Britain at the congress of Cambray, engaged him to become tutor and companion to his eldest son, who was then about to set out on his travels. After a short stay at Paris, and visiting other towns in France, they fixed in Lorraine, where Maclaurin wrote his tract on the percussion of bodies, which gained the prize of the Royal Academy of Sciences for the year 1724. But his pupil dying soon afterwards, at Montpellier, he returned immediately to his profession at Aberdeen. He was hardly settled there, however, when he received an invitation to Edinburgh; the curators of that university being desirous that he should supply the place of Mr James Gregory, whose great age and infirmities had rendered him incapable of teaching. He had some difficulties to encounter, arising from competitors, who had good interest with the patrons of the university, and also from the want of an additional fund for the new professor; but at length these were all surmounted, principally by the means of Sir Isaac Newton. In November 1725 he was introduced into the university. After this, the mathematical classes soon became very numerous, there being generally upwards of a hundred young gentlemen attending his lectures every year, who being of different standing and proficiency, he was obliged to divide them into four or five classes, in each of which he employed a full hour every day, from the first of November till the first of June.

He lived a bachelor till the year 1733; but being not less formed for society than for contemplation, he then married Anne, the daughter of Mr Walter Stewart, solicitor-general for Scotland. By this lady he had seven children, of whom two sons and three daughters, together with his wife, survived him. In 1734, Berkeley, bishop of Cloyne, published a piece called *The Analyst,* in which he took occasion, from some disputes which had arisen concerning the grounds of the method of fluxions, to attack the method itself, and also to charge mathematicians in general with infidelity in religion. Maclaurin thinking himself included in this charge, began an answer to Berkeley's book; but, as he proceeded, so many new theories and problems occurred to him, that instead of a vindicatory pamphlet, his work came out a complete system of Fluxions, with their application to the most considerable problems in geometry and natural philosophy. This work was published at Edinburgh in 1742, in two vols. quarto; and as it cost him infinite pains, so it is the most considerable of all his works. In the mean time, he was continually obliging the public with some performance or observation of his own, many of which were published in the fifth and sixth volumes of the Medical Essays at Edinburgh. Some of them were likewise published in the Philosophical Transactions, particularly, 1. Of the Construction and Measure of Curves; 2. A new Method of describing all kinds of Curves; 3. A Letter to Martin Folkes, Esq. on Equations with impossible Roots, May 1726; 4. Continuation of the same, March 1729; 5. On the Description of Curves, with an account of farther improvements, and a paper dated at Nancy, November 27, 1722; 6. An account of the Treatise of Fluxions, January 27, 1742; 7. The same continued, 10th March 1742; 8. A Rule for finding the meridional parts of a Spheroid with the same exactness as of a Sphere, August 1741; 9. Of the basis of the cells wherein the Bees deposit their Honey, 3d November 1734.

In the midst of these studies, he was always ready to lend his assistance in contriving and promoting any scheme that might contribute to the service of his country. When the Earl of Morton set out in 1739 for Orkney and Zetland, to visit his estates there, he desired Mr Maclaurin to assist him in settling the geography of those countries, which is very erroneous in all our maps; to examine their natural history, survey the coasts, and measure a degree of the meridian. Maclaurin's family affairs, and other connections, would not permit him to do this; he, however, drew up a memorial of what he thought necessary to be observed, furnished the proper instruments, and recommended Mr Short the optician as a fit person for the management of them. He had still another scheme for the improvement of geography and navigation, of a more extensive nature; which was the opening of a passage from Greenland to the South Sea by the north pole. That such a passage might be found, he was so fully persuaded, that he has been heard to say, that if his situation admitted of such adventures, he would undertake the voyage, even at his own charge. But when schemes for discovering it were laid before the parliament in 1744, and he was himself consulted by several persons of high rank concerning them, before he could finish the memorials which he proposed to send, the premium was limited to the discovery of a north-west passage; and he used to regret that the word west was inserted, because he conceived that the passage, if it existed at all, would be found not far from the pole.

In 1745, having been very active in fortifying the city of Edinburgh against the Highland army, he was obliged to fly from thence to the north of England, where he was invited by Herring, then archbishop of York, to reside with him during his stay in this country. In this expedition, however, being exposed to cold and hardships, and naturally of a weak and delicate constitution, he laid the foundation of an illness which put an end to his life, in June 1746, at the age of forty-eight.

Mr Maclaurin was a good as well as a great man, and worthy of esteem as well as admiration. His peculiar merit as a philosopher consisted in this, that all his studies were accommodated to general utility; and we find, in many places of his works, an application even of the most abstruse theories, to the perfecting of the mechanical arts. For this purpose, he had resolved to compose a course of practical mathematics, and to rescue several useful branches of the science from the bad treatment which they had often met with in less skilful hands. But all this was prevented by his death; unless we should reckon, as part of his intended work, the translation of Dr David Gregory's *Practical Geometry*, which he revised, and published with additions in 1745. In his lifetime, however, he had frequent opportunities of serving his friends and his country by his great skill. Whatever difficulty occurred concerning the constructing or perfecting of machines, the working of mines, the improving of manufactures, the conveying of water, or the execution of any other public work, he was at hand to resolve it. He was likewise employed to terminate some disputes of consequence which had arisen at Glasgow concerning the gauging of vessels; and for that purpose presented to the Commissioners of Excise two elaborate memorials, with demonstrations, containing rules by which the officers now act. He also made calculations relating to the provision, now established by law, for the widows and children of the Scotch clergy, and of the professors in the universities, entitling them to certain annuities and sums, upon the voluntary annual payment of a certain sum by the incumbents. In contriving and adjusting this wise and useful scheme he bestowed a great deal of labour, and contributed not a little towards bringing it to perfection. Of such a man, it may be said that he lived to some purpose; which can hardly be predicated of those, how uncommon soever their abilities and attainments, who spend their whole time in abstract speculations, and produce nothing really useful or serviceable to their fellow-creatures.

Of his works, we have mentioned his *Geometria Organica*, in which he treats of the description of curve lines by continued motion. We need not repeat what has been said concerning the paper which gained the prize of the Royal Academy of Sciences in 1724. In 1740 the academy adjudged him a prize, which did him still more honour, for solving the motion of the tides from the theory of gravity; a question which had been given out the previous year, but without receiving any solution. He had only ten days to draw up this paper, and could not find leisure to transcribe a fair copy; so that the Paris edition of it is incorrect. He afterwards revised the whole, and inserted it in his Treatise of Fluxions; as he did also the substance of the former paper. These, with the Treatise of Fluxions, and the pieces printed in the Philosophical Transactions, of which we have given a list, are all the writings which Maclaurin lived to publish. Since his death, two more volumes have appeared, containing his Algebra, and his Account of Sir Isaac Newton's Philosophical Discoveries. His Algebra, though not finished by himself, is yet allowed to be excellent of its kind, containing, in a volume of no great bulk, a complete elementary treatise of that science, as far as it had then been carried. The occasion of his Account of Sir Isaac Newton's Philosophy may be shortly stated. Sir Isaac having died in the beginning of 1728, his nephew, Mr Conduitt, proposed to publish an account of his life, and desired Mr Maclaurin's assistance. The latter, out of gratitude to his great benefactor, cheerfully undertook, and soon finished, the history of the progress which philosophy had made before Sir Isaac's time; and this was the first draught of the proposed work; but as the latter did not go forward, on account of Mr Conduitt's death, the manuscript was returned to Mr Maclaurin. To this he afterwards made great additions, and left it in the state in which it now appears. See the DISSERTATIONS prefixed to this work.

MACON, an arrondissement of the department of the Saone and the Loire, in France, extending over 454 square miles. It is divided into nine cantons, and subdivided into 135 communes, containing 108,500 inhabitants. The capital is the city of the same name, and it is also the capital of the department. It is situated on the right bank of the Saone, over which is a fine bridge. It is ill built, with narrow, crooked streets; and the only fine object is the quay by the side of the river, the Hôtel de Ville, and the palace Montrevel. It contains 1400 houses, with 10,000 inhabitants, whose chief trade is in wine, and in linen and stocking weaving. Long. 4. 44. 48. E. Lat. 46. 18. 17. N.

MACOWALL, a Sikh town in the province of Lahore, on the banks of the Sutleje river, 133 miles from the city of Lahore. Long. 75. 38. E. Lat. 31. 14. N.

MACQUARRIE ISLAND, in the South Pacific Ocean, was discovered in 1811, by some resolute adventurers from New Holland, who had penetrated into the Southern Ocean in prosecution of the seal fishery. It is eighteen miles in length from north to south, and about six in breadth. At the distance of eight leagues from the north point of this island are other smaller islands, called the Judge and his Clerks, and several others in a south direction, called the Bishop and his Clerks. Long. 169. E. Lat. 52. 41. S.

MACQUER, PIERRE JOSEPH, was born at Paris on the 9th of October 1718, and died there on the 16th of February 1784. He was member of the Academy of Sciences, and professor of pharmacy; and was engaged in the *Journal de Sçavans* for articles in medicine and chemistry. With the last of these sciences he was intimately acquainted. He had a share in compiling the *Pharmacopœia Parisiensis*, published in 1758, in 4to. His other works are, 1. Elémens de Chimie Théorique, Paris, 1749, 1753, 12mo; 2. Elémens de Chimie Pratique, 1751, in two vols. 12mo; 3. Plan d'un cours de Chimie Expérimentale et Raisonnée, 1757, 12mo, in the composition of which he was associated with M. Beaumé; 4. Formulæ Medicamentorum Magistralium, 1763; 5. L'Art de la Teinture en Soie, 1763; 6. Dictionnairc de Chimie, contenant la Théorie et la Pratique de cet Art, 1766, in two vols. 8vo, which has been translated into German with notes, and into English with notes by Mr Keir. Macquer has, by his labours and writings, greatly contributed to render useful an art which formerly tended only to ruin the health of the patient by foreign remedies, or to reduce the professors of it to beggary, whilst they prosecuted the idle dream of converting every thing into gold.

M‘CRIE, THOMAS, D.D., an eminent biographer and divine, was born at Dunse, in North Britain, in the month of November 1772. His parents belonged to the class of Seceders known in Scotland as Antiburghers, and he was educated with a view to the ministry in that persuasion. After passing through the ordinary course of education afforded in a country town, he came to Edinburgh, and enrolled himself as a student in the university, in the winter of 1788.[1] During that and the two following sessions he pursued the course of literary and philosophical study prescribed to students intending to devote themselves to the ministry; and in 1791, he entered the theological class at Whitburn, under the Rev. Archibald Bruce, the teacher or professor of divinity to the Associate Antiburgher Synod. As the attendance upon this course was only for a limited period each year, it was usual for the students, whose means were generally very scanty, to employ the intervals in teaching. In this way Mr M‘Crie, in the autumn of 1791, proceeded to Brechin, and opened a school in connection with the Associate Antiburgher congregation in that town; and he continued there, excepting the time annually required at Whitburn in the three following sessions (1792 to 1794) for completing the regular course of theological study.

Towards the end of 1795, Mr M‘Crie was licensed to preach by the presbytery of Kelso. In the beginning of the next year, he received a call from the Second associate congregation of Antiburghers in Edinburgh; and some scruples having been obviated by an act of the Associate

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[1] Matriculation books of the University.—At this time he wrote his name M^{c}Crie; and in strict arrangement this article belonged to a former sheet.

Synod, dated 3d May 1796, he was ordained to that charge on the 26th of that month.[1] In this pastoral relationship he continued for upwards of ten years, evidently with the sincere attachment of his people.

At this period, Mr M‘Crie, by diligent and assiduous study, was acquiring that profound theological knowledge, and that fund of literary and ecclesiastical information, for which, in after life, he was so distinguished. The proceedings of the religious body with whom he was connected may also have had some effect in directing his pursuits towards subjects connected with the history, constitution, and polity of the reformed church. Yet, excepting a missionary sermon, which was published in 1797, at the special request of his congregation,[2] we cannot trace back the commencement of his literary career farther than the year 1803, although some articles, of an earlier date, in a periodical work entitled " The Christian Magazine, or Evangelical Repository," may have proceeded from his pen.[3] To this magazine he contributed a series of articles, with the signature of PHILISTOR (a lover of history), and these included, in 1803, " The History of the New Testament confirmed and illustrated by passages of Josephus, the Jewish historian;" " Memoir of Mr John Murray, minister of Dunfermline ; " Sketch of the Progress of the Reformation in Spain, with an account of Spanish Protestant Martyrs ;" and " Illustrations of Scripture as to the grinding and parching of Corn." In 1804, " Suppression of the Reformation in Spain, with a continuation of the Account of Spanish Protestant Martyrs ;" " Remarks on Matthew, xx. 25, 26 ;" " On the Origin of the Taborites ;" " Life of John Wickliffe ;" " Life of John Huss ;" " Martyrdom of Jerome of Prague ;" " Martyrs in Britain, from the time of Wickliffe to the Reformation ;" and " Influence of the Opinions of Wickliffe upon the English Reformation, with additional notices of Martyrs." In 1805, " The Life of Theodore Beza ;" and the " Life of Dr Andrew Rivet," a Protestant divine in France. In 1806, " The Life of Patrick Hamilton, the Proto-Martyr of the Reformation in Scotland ;" " The Life of Francis Lambert of Avignon ;" " Account of Bugenhagen, a German Reformer ;" " The Life of Alexander Henderson, minister of Edinburgh, and one of the commissioners from the Church of Scotland to the Assembly of Divines at Westminster ;" and " Historical Notices respecting learned Scottish Divines in England and Foreign Parts, during the sixteenth century."

We have been particular in enumerating the titles of the above articles, as they show very distinctly the peculiar bent of Mr M‘Crie's mind, at this early period, towards subjects illustrative of the history and progress of the Reformation throughout Europe, and of the biography of eminent martyrs and reformers ; in fact, containing the germs of most of his subsequent publications.

We have now arrived at a point in Mr M‘Crie's history, which makes it necessary to advert to the proceedings of the Associate Synod. But to enter into such minute details as might render the subject sufficiently intelligible to a general reader, would not only occupy too much space, but might seem to be misplaced in this work. Yet it would be false delicacy, even in a sketch of his literary life like the present, to pass in silence the results of such proceedings ; and the more so, as his conduct, in the painful situation in which he was placed, displayed no small degree of Christian resignation and fortitude, and evinced that he was sustained by a sense of duty and high-minded principle. Suffice it then to say, that Mr M‘Crie was one of five ministers[4] who felt themselves constrained to resist and protest against what they considered to be a spirit of innovation on the part of the Synod, while engaged in the revisal and enlargement of the Judicial Act and Testimony, which had hitherto served as the bond of ministerial and religious communion, in order, as it was expressed, to adapt it " more to the circumstances of the present time." It need only be stated, that the chief points of difference related to the apparent abandonment by the Synod of some important principles of the Judicial Act and Testimony,—more especially the received doctrine on the connection between church and state, the power of the civil magistrate in matters of religion, and the lawfulness and perpetual obligation of our national covenants,—points which had hitherto been maintained by the members of Secession. In this revisal the Synod continued at their half-yearly meetings, until it was completed in April 1804, and published under the title of " Narrative and Testimony agreed upon and enacted by the General Associate Synod," &c. This contained, first, " A Narrative of the State of Religion in Britain and Ireland, from the period of the Reformation to the present time," including a history of the Secession Church, and a view " Of the progressive Defections of the Established Church of Scotland ;" and, secondly, the Testimony, or Declaration, under several heads, of the doctrinal sentiments professed by the Associate Synod, along with a Formula, which should hereafter be " the term of admission for those who shall apply for joining in communion with us."

The case of the four surviving protestors who had disclaimed the power of the Associate Synod, either to alter their original Testimony, or to impose new terms of communion for their body, was before the meeting of the Synod at Glasgow, at the end of August 1806, and, by a formal resolution, was postponed till the ensuing meeting in April next. It happened, however, that whilst the subject was under discussion, Mr M‘Crie and other two of the protestors met at Whitburn to assist Mr Bruce upon a sacramental occasion ; and these four, after serious deliberation, constituted themselves into a separate presbytery or jurisdiction. Information of this having reached Edinburgh, Mr M‘Crie was interrogated by some members of his session, when he admitted the fact; immediately upon which a communication was transmitted to the Synod at Glasgow; and as it was considered that, "with regard to Mr M'Crie, forbearance could no longer be tolerated," it was moved, and a sentence passed (2d of September), deposing him from the office of the holy ministry.[1] The other protesting ministers were afterwards deposed in as peremptory a manner. It may be said that the Synod could not act otherwise in regard to their brethren who had set themselves in such direct opposition, by disclaiming the jurisdiction of that court. But, to say nothing of the precipitate manner of passing such a sentence, it was at least a harsh, if not unjustifiable proceeding, to subject to the summary punishment of deposition and excommunication, persons against whom calumny had never surmised the slightest charge, either as to moral conduct or error in doctrine; and while, by so doing, dissensions were raised in congregations, it was somewhat strange to find the very men who repudiated the doctrine of interference of the civil magistrate in matters of religion, calling in such aid to exclude from their own congregations ministers who had been regularly ordained, and who maintained all the obligations imposed upon them at ordination. Yet all this was done, according to Mr Bruce's statement, "under high pretensions to lenity and moderation, of promoting universal liberty of conscience, and of greatly detesting and condemning all impositions and compulsion;" and, as he elsewhere remarks, that "to dissolve a pastoral relation duly established, and while mutually acknowledged, by mere church authority, without relevant reasons, is as really oppression, and a robbing the people of their sacred privileges, as to intrude a minister upon a congregation without their consent, which was one of the chief and primary grounds of the Secession."[2]

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[1] This congregation was constituted in 1791, and their meeting-house in the Potterrow was erected in 1792 ; but they enjoyed the advantage of a settled minister only when Mr M‘Crie was ordained. The sermon and address at his ordination, 26th May 1796, form part of a volume (pp. 164–202) of " Sermons preached on different occasions, by Robert Chalmers, minister of the Gospel at Haddington." Edinburgh, 1798, 12mo, pp. 440.

[2] " The Duty of Christian Societies towards each other, in relation to the measures for propagating the Gospel which at present engage the attention of the Religious World. A Sermon, preached in the Meeting-house, Potterrow, on occasion of a collection for promoting a Mission to Kentucky." Edinburgh, 1797, 8vo, pp. 40. This sermon Mr M‘Crie afterwards had some wish to suppress, at least he regretted its publication, from having changed his views on some points which it embraced.

[3] This periodical work, in sixpenny numbers, was commenced in February 1797. In the number for April 1801 is a " Proposed Plan of a New Literary Society, to be named The Voluntary Society for Improvement in Ecclesiastical History and Biography ;" and in September 1802, a translation of part of Smeton's Life and Death of John Knox, from the Latin, 1579, both of which probably were contributions from Mr M‘Crie. One of the editors, the Reverend George Whytock, Dalkeith, having died about the end of 1805, Mr M‘Crie became the sole editor of the volume for 1806 ; but a variety of circumstances led to its discontinuance, and a new series was commenced in January 1807, chiefly under the auspices of his brethren from whom he had separated, as stated above.

[4] The other members were, the Rev. Archibald Bruce, Whitburn ; Rev. George Whytock, Dalkeith ; Rev. James Aitken, Kirrymuir ; and the Rev. James Hog, Kelso. Mr Whytock died in October 1805, nearly twelve months before the Synod proceeded to extremities. The other protestors were afterwards joined by the Rev. Robert Chalmers, Haddington.

The Synod having appointed one of their number to proceed to Edinburgh, to intimate, on the next Sabbath (7th September), the sentence of Mr M'Crie's deposition, from his own pulpit, we must next briefly advert to the proceedings of his congregation. It appears that the leaven of the new-light doctrines had lately infected several of the leading members; yet, as it was found that the trustees and seat-holders, both in point of number, and the amount paid for sittings, were nearly equal, the question arose, to whom the property of the meeting-house in the Potterrow belonged. Such disunion was the occasion of a tedious litigation in the Court of Session, during which time he was interdicted access to his pulpit on the afternoon of every Sabbath. The Court of Session having declined entering upon the question as to which party was chargeable with schism, at length pronounced a decision, 24th February 1809, in favour of the new-light members, as "forming a congregation of Christians in communion with, and subject to the ecclesiastical discipline of, a body of dissenting Protestants, calling themselves the Associate Presbytery and General Associate Synod of Antiburgher Seceders."[3] After this, Mr M'Crie's congregation assembled in the meeting-house in Carrubber's Close, till their new chapel in Davie Street, Richmond Place, was erected, and in which he continued to officiate till the close of his life.

In the meanwhile, the small party of "Old-Light Antiburghers," as the protestors were commonly called, assumed the name of the "Constitutional Associate Presbytery;" and, finding themselves placed in such peculiar circumstances, and their sentiments and conduct liable to misrepresentation, they resolved to publish "a fuller statement and explanation of the principal heads of controversy between the Synod and them." For this purpose, the task was devolved upon Mr M'Crie, as clerk of the presbytery; and, from papers partly written and wholly revised by him, there appeared, in 1807, under his name, a "Statement of the Difference between the profession of the Reformed Church of Scotland, as adopted by Seceders, and the profession contained in the New Testimony and other Acts, lately adopted by the General Associate Synod; particularly on the power of Civil Magistrates respecting Religion, National Reformation, National Churches, and National Covenants. To which are added, Reasons by the Ministers who Protested against the above Acts of Synod, for constituting themselves into a separate Presbytery, with the deed of Constitution," &c. 8vo, pp. 234. Although of a controversial nature, respecting differences which attracted no very great share of public notice at the time, this Statement is also applicable to discussions which have recently been much more widely agitated by the voluntary question; and it may be appealed to by the friends of the established church, as explaining and enforcing the true grounds of connection between the church and state, and as an able and elaborate argument of the obligation on civil rulers to make suitable provision for the religious interests of the community. Yet it was generally conceived that the protestors had displayed unnecessary zeal and obstinacy in stedfastly opposing the measures of the Synod, as if they had been contending for mere abstract theoretical points of no practical importance.

In the comparatively obscure and humble situation in which Mr M'Crie was now placed, he was enabled to devote his leisure hours to his favourite literary pursuits. His intention was to have published a life of Alexander Henderson, the eminent Scottish divine, of which a sketch had appeared in the Christian Magazine. In the view of giving an introductory account of the state of the reformed church, he found that the materials were amply sufficient for a separate work; and abandoning his original design, as one that might be resumed at some future time, he undertook a Life of John Knox, and in this form sought to illustrate the earlier history of the Protestant church in Scotland. The subject was felicitously chosen, not only as possessed of historical importance and of national interest, but as one which required, and which was capable of being placed in a new point of light. "The Life of John Knox, containing Illustrations of the History of the reformation in Scotland," appeared in the beginning of 1812, in one volume 8vo, pp. 580. Such was the effect produced by this work, that although, even in Edinburgh, the author's name was quite unknown in the literary circles, it placed him at once in the first rank of ecclesiastical biographers, and established his reputation as an historical writer, both at home and abroad. The character of the great reformer had hitherto been much calumniated and mistaken. Knox, indeed, was one of the most marked characters in Scottish history, admirably suited to the circumstances in which he was placed. He had, however, been too often represented as a fierce and sullen bigot, equally opposed to learning, liberal principles, and sound policy; coarse in manners, intolerant in conduct, and actuated by sordid and ambitious views. It remained to reverse the picture, and to show the reformer in a juster light; influenced by the purest and noblest principles; filled with apostolical zeal, and a total disregard of worldly rank and power; stern and uncompromising only in the cause of truth, and in reproving vice and error; distinguished for profound learning and true piety; and with that incorruptible integrity and heroic courage required for carrying on the work of reformation. All this was accomplished in Mr M'Crie's work, which possessed the rare quality of uniting history with biography; and it was noticed in terms of high commendation in most of the leading journals of the time. As, in fact, the "Life of Knox" must be held to be the author's principal production, we cannot resist the opportunity of giving a quotation from an article in the Edinburgh Review for July 1812, usually ascribed to the distinguished editor.

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[1] See "Letters on the late Transactions of the General Associate Synod at Glasgow," in the New Series of the *Christian Magazine*, vol. i. pp. 24-35, 61-72. The anonymous writer of these Letters asserts that the Protestors had all along been treated by the Synod with great lenity and forbearance.

[2] "A Review of the Proceedings of the General Associate Synod, and of some Presbyteries, in reference to the Ministers who protested against the imposition of a New Testimony," &c.; by A. Bruce, minister in Whitburn, p. 405. Edinburgh, 1808, 8vo.

[3] Faculty Decisions, 1808-1809, p. 221.

"How unfair, and how marvellously incorrect, these representations (of Knox's character) are, may be learned from the book before us; a work which has afforded us more amusement and more instruction than any thing we ever read upon the subject; *and which*, independent of its theological merits, *we do not hesitate to pronounce by far the best piece of history which has appeared since the commencement of our critical career.* It is extremely accurate, learned, and concise, and at the same time very full of spirit and animation; exhibiting, as it appears to us, a rare union of the patient research and sober judgment which characterise the more laborious class of historians, with the boldness of thinking, and force of imagination, which is sometimes substituted in their place. It affords us very great pleasure to bear this public testimony to the merits of a writer who has been hitherto unknown, we believe, to the literary world, either of this or the neighbouring country; of whom, or of whose existence at least, though residing in the same city with ourselves, it never was our fortune to have heard till his volume was put into our hands; and who, in his first emergence from the humble obscurity in which he has pursued the studies and performed the duties of his profession, has presented the world with a work which may put so many of his contemporaries to the blush, for the big promises they have broken, and the vast opportunities they have neglected."

Such a favourable award had the effect of directing attention to the work, and of calling for a new edition, which appeared in an enlarged and corrected form in 1813.[1] In preparing this edition, the author not only made corrections, both as to style and matter, but, as the reformer's name is so inseparably connected with the history of public events, he introduced greater detail of public transactions, tending to vindicate the proceedings of the early reformers, and to throw light on the character and motives of the other prominent actors of the time.

Before this edition was published, the Senatus of the University of Edinburgh, on the 3d of February 1813, conferred on Mr M'Crie the honorary degree of Doctor of Divinity; a compliment alike deserved by the author of the Life of Knox, and honourable to his Alma Mater, our metropolitan university. This act was the more honourable, as it was one of the first instances of such a title having been conferred on a person, though holding the same professions, not strictly belonging to the established church.

Thus encouraged to pursue his literary career, the next subject in which Dr M'Crie engaged was a Life of Andrew Melville, the able and intrepid assertor of Presbytery; which might serve as a continuation to his former work, by giving an account of ecclesiastical transactions in Scotland during the latter part of the sixteenth and beginning of the seventeenth century. It was not till the end of 1819 that the work was published, in two volumes 8vo.[2] It presented the results of long-continued, minute, and discriminating research into the literary as well as the ecclesiastical history of the period. The exertions of Melville in behalf of our national church well merited the labours of such a biographer; and as he was successively at the head of two of our principal colleges, Glasgow and St Andrews, an opportunity was also afforded of entering fully into the state of education and the progress of literature at that time. Although in no respect less valuable and important, it was not so successful as its precursor; as, in fact, the mass of literary information it conveys was not of a kind to attract public regard and secure popularity. Melville's influence in church courts far surpassed that of any of his contemporaries, but it was not so powerfully felt, like that of Knox, in public events. Yet his character is highly interesting, and stands out in bold relief, finely contrasted with the milder dispositions of his nephew James Melville (whose Diary presents so many minute and affectionate notices of his uncle, whilst his own letters, written in exile, breathe a kindred spirit of sympathy and love), as an elegant and accomplished scholar, a profound divine, kind and affectionate in all the private relations of life, and at the same time undaunted and uncompromising in asserting and vindicating the rights and liberties of the presbyterian party. The period to which Dr M'Crie's work relates is not less important, as it embraces the contests between the church and the court, the establishment on its present basis of the presbyterian polity, and its temporary overthrow after a long and arduous struggle.

Having in the life of Melville traced the progress of ecclesiastical affairs till near the close of the reign of James I., it was natural to think that Dr M'Crie would have resumed his first intention, by publishing a Life of Alexander Henderson. But the state of his health, and the fear of engaging in such laborious and protracted researches as he had just terminated, deterred him from commencing, or at least induced him to postpone, such a task. Strong inducements, moreover, were held out to him, first to become the editor of a new edition of Wodrow's History, and afterwards to write a new work on the same period, or a history of the religious persecutions in Scotland; but neither of these was undertaken, and he remained for a length of time undetermined in what work he should next engage. Besides Henderson's life, he thought of Wickliffe and the precursors of Luther,—of Calvin,—and of a history of the progress of the Reformation throughout Europe. Various obstacles intervened to his successfully embarking in either of these undertakings, and therefore it is the more deeply to be regretted that any circumstances should have prevented him from pursuing his primary intention, which might for a time have happily limited his researches to his own country, and to events with which he was so conversant. We happen to know, that when Dr M'Crie was urged to this, all his old predilections would revive, and he would admit his anxious desire to continue the period of his biographies to the Restoration. He would say, however, that a life of Henderson, who died in 1646, would leave such a work incomplete, and he should feel some difficulty in fixing on any person of sufficient importance, and whose principles and conduct he approved, to connect with Henderson for the subsequent events. As his own views led him to approve of the party named "Protestors," he no doubt would, had he actually set about such a work, have given the preference to James Guthrie, minister of Stirling, who suffered as a martyr for his principles upon the restoration of Charles II. Besides the advantage of thus presenting, in the form of biographical narrative, a continuous history of what has been called the Second, as well as of the First Reformation, it was a subject calculated to excite very general interest; and the whole tenor of Dr M‘Crie's pursuits eminently fitted him to render it attractive. But it was destined to be left to other hands.[1] We have only to express a wish, that in the publication of his miscellaneous writings, which have been announced, a conspicuous place may be assigned to his admirable sketch of Henderson's life, which appeared in the Christian Magazine for 1806.

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[1] The fifth edition, carefully revised by the author, and containing his last corrections, was published in 1831. This, as well as the second, third, and fourth editions, is in two volumes 8vo.

[2] The title is, "The Life of Andrew Melville; containing Illustrations of the Ecclesiastical and Literary History of Scotland during the latter part of the Sixteenth and beginning of the Seventeenth Century. With an Appendix, consisting of original papers." A second edition, revised, was published in 1824, also in 2 vols. 8vo.

Whilst engaged in the life of Melville, Dr M‘Crie became an occasional, if not a stated contributor, to the "Edinburgh Christian Instructor," a well-known monthly publication, edited by the late Reverend Dr Andrew Thomson, with whom he continued on terms of cordial intimacy and friendship till the close of his highly useful career. He also lent occasional aid to other periodicals; but as we have no means of exactly ascertaining his communications,[2] we shall merely allude to one article in the Instructor which excited considerable attention at the time. This was a review, in 1817, of the first series of the "Tales of my Landlord," which appeared in three successive numbers of that magazine, and contained an elaborate defence of the persecuted covenanters, who made such a noble struggle for civil as well as religious freedom, against the unprincipled and tyrannical measures of the government of Charles II., whilst it exposed the erroneous and exaggerated representation of their manners and principles given in the tale of "Old Mortality." But the most singular circumstance connected with this review was, that Sir Walter Scott, who had not then stood forth as the acknowledged author of the Waverley Novels, was prevailed upon, by the editor of the "Quarterly Review," to become the reviewer of his own work; and thus he took an opportunity, whilst vindicating the statements contained in his novel, tacitly to answer the article in the Instructor.

In February 1816, the Reverend Archibald Bruce, Antiburgher minister at Whitburn, who for upwards of thirty years had filled the office of professor of divinity, died full of years and honour, and Dr M‘Crie was naturally looked to as the fittest person in their body for his successor. The number of students was not considerable; but the duties of the professorship must have occupied much of his time during the ordinary terms of session. He commenced his lectures on the 1st of October 1817, with a suitable and feeling allusion to the loss the church at large had sustained by the death of his venerable friend and instructor. Two letters, written at the time of the funeral to a brother clergyman in the country, which have recently appeared,[3] bear strong testimony of his esteem and reverence for the worth and talents of this learned and worthy divine, who was distinguished by a congeniality of mind and fondness of literary research. Dr M‘Crie filled the professor's chair until 1827, when he resigned it in consequence of an event which may be adverted to in a few words. In 1820, a union of the two largest bodies of dissenters in Scotland took place, under the title of the "United Associate Synod of the Secession Church." Several members of the Antiburgher Synod having protested against the basis of union, and declined participating in it, formed themselves into a separate court, still retaining the name of the "Associate (Antiburgher) Synod." From their similarity of sentiment and profession with the "Constitutional Associate Presbytery," a proposal for re-uniting was afterwards brought forward, when Dr M‘Crie on the one side, and Professor Paxton on the other, were appointed to draw up the "Articles agreed upon, &c. with a view to Union," and the "Overtures of a Testimony." This union was effected in May 1827, under the designation of the "Associate Synod of Original Seceders;" and it was on this occasion that Dr M‘Crie resigned the divinity chair to the Rev. George (now Dr) Paxton, the learned author of "Illustrations of the Holy Scriptures." The "Testimony" then published, as agreed upon by the Synod, it is understood was the composition, in the historical part, of Dr M‘Crie, and in the doctrinal part, of Dr Stevenson, Ayr. Here it may be remarked, that the Church of Scotland owes no ordinary debt of gratitude to the Original Seceders, for their constant adherence to the same principles, and even for their continued testimony against error in the administration of church affairs. As to Dr M‘Crie individually, although he saw no prospect of being able conscientiously to join the establishment, he was ever warmly attached to the church, and felt a deep interest in her prosperity. Such attachment is manifested in all his writings, and remained unimpaired till the day of his death. A few words on this head may be quoted from a sermon on the aspect of the times, delivered in May 1834. Addressing the members of his own congregation, he says, "After long examination, I am fully convinced that, by the good hand of God, you have been led, in respect of profession and communion, to take up your ground in the safe medium between the conflicting parties in the great controversy of the day, while you continue to testify against the corruptions of the churches established by law in our native land, and at the same time keep aloof from those who condemn all recognition of Christianity by public authority, and seek to withdraw the provision which has been made by the nation for religious purposes. I cannot (he adds) flatter you with the prospect of the speedy removal of those defects in the national settlement of religion, or those practical abuses in ecclesiastical administration, which the body we are connected with have so long condemned, and which have excluded us from fellowship with the national church in Scotland...Nothing on earth would give more joy to my heart, than to see sure and decided symptoms of reformation in the national church of Scotland...I would go seven times to the top of her highest mountain to look out for the harbinger of her relief, though each time I should have to return with the message, 'There is nothing,' provided at last I could hail the appearance of 'the little cloud out of the sea, like a man's hand,' the sure prelude of the plentiful rain which shall refresh the weary inheritance, make her wilderness an Eden, and her desert as the garden of the Lord."

But, to resume the series of Dr M‘Crie's literary labours (of which the want of space will prevent us offering little more than a brief enumeration): In 1821 he published a little volume containing "Two Discourses on the Unity of the Church, her Divisions, and their removal. To which is subjoined, A short View of the plan of Religious Reformation originally adopted in the Secession." 12mo, pp. 174.

This was followed in 1825 by a volume entitled "Memoirs of Mr William Veitch and George Bryson, written by themselves: with other narratives illustrative of the History of Scotland, from the Restoration to the Revolution: to which are added, Biographical Sketches and Notes, by Thomas M‘Crie, D.D." 8vo, pp. 540. In the preface the editor observes, “that, with a little more labour, a connected history of the period might have been produced; but I am persuaded that no account which I could draw up would present so graphic a picture of the men and measures of that time, as is exhibited in the following historical pieces.” These are indeed highly graphic and interesting, but the volume might be instanced as a proof of what Dr M‘Crie confesses, that the time and labour bestowed upon it would have gone far to produce an original work of greater importance. In reviewing this volume, the editor of the Edinburgh Christian Instructor sums up with saying, “in Dr M‘Crie we see all we could wish for in the historian of the presbyterian church; and if he would add to his former labours a history of that church from the beginning of Charles the First’s reign to the Revolution, we are sure the public would receive it with feelings of the highest satisfaction.”

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[1] A History of the Life and Times of Henderson has lately been published by the Rev. Dr Aiton, minister of Dolphington.

[2] In the Edinburgh Review for April 1830, there is an article by Dr M‘Crie, on the Memoirs of Sir James Turner, published for the members of the Bannatyne Club, from an original manuscript.

[3] In a volume of "Sermons, by the late Rev. James Aitken, Minister of the Associate Congregation of Original Seceders, Kirrymuir. With a Memoir of the Author, and a number of his Letters." Edin. 1836, 12mo, pp. 400–2.

This hint, however, was not taken, as the next subject of his investigation led to the publication, in 1827, of a “History of the Progress and Suppression of the Reformation in Italy in the Sixteenth Century, including a Sketch of the Reformation in the Grisons,” 8vo, pp. 434 (of which a second edition appeared in 1828). Also, in 1829, as a sequel to that work, a “History of the Progress and Suppression of the Reformation in Spain in the Sixteenth Century,” 8vo, pp. 424. These volumes undoubtedly form a valuable accession to the history of the Reformation throughout Europe, although the author laboured under great disadvantages in having but limited access to original sources of information, compared to what was within his reach in matters of our own ecclesiastical history; and it was felt, that they tended rather to excite a desire for information than fully to gratify it, and that the materials were not equal to the skill and industry displayed. It is clear that the state of public opinion had prepared the way for a reformation even in Italy, the stronghold of the Roman Catholic church, and the progress that great cause made was indeed remarkable and extensive; but nothing could withstand the systematic, unceasing, and exterminating measures employed to arrest the progress of reformed opinions; and the more so as these were not counteracted by any opposing interests of the civil and ecclesiastical authorities either in Spain or Italy, whilst the strength of the reformers, having no unity of purpose, was wasted by unhappy divisions among themselves. Both volumes, however, present very interesting and affecting particulars of the sufferings of those who were doomed to exile, imprisonment, or death, for religious liberty and for the truth.

Dr M‘Crie was at length induced to undertake a more arduous task, which had been looked for from his hand, and which he himself had long contemplated. This was a Life of John Calvin the reformer. To do justice to such a work, he considered a lengthened residence at Geneva, where the most important original documents are preserved, to be quite essential; but a due attention to his ordinary ministerial functions precluded him from the chance of ever being able to leave home for so long a period. The prospect of his son, Mr John M‘Crie, going abroad, and remaining several months at Geneva, in some measure obviated this difficulty, as he could not only trust to his accuracy in transcribing Calvin’s original letters, but, by regular communication, hope to obtain all the requisite information from other sources, and in as satisfactory a manner as if he himself were on the spot to direct such researches. His son accordingly set about the task most assiduously, and, with a zeal, knowledge, and perseverance worthy of all praise, transmitted such a mass of materials as could not have failed, in Dr M‘Crie’s hands, to have rendered his work one of the highest importance in ecclesiastical biography. He had in fact made considerable progress in writing the earlier portion, and was intently engaged upon it (in the midst of the constant interruptions to which he was subjected), at the time when all his earthly labours were brought unexpectedly to a close. It is understood that one of his sons has the intention, from the materials already collected, to complete a Life of Calvin; otherwise, even as a fragment, the portion actually written should not be withheld from the public.[1]

Dr M‘Crie’s sedentary habits and application to study were not favourable to health, if he ever could be said to have been very robust. In the summer of 1835 he had been confined for a time through indisposition, but there was no apparent change to indicate the suddenness of his decease. In fact, a short absence in the country seemed to have re-established his health, and he was so far recovered, that, on Sabbath the 2d of August, he preached as usual, both in the forenoon and afternoon, and walked out on the following Tuesday to visit a neighbour; but on the afternoon of that day, about five o’clock, he was taken alarmingly ill, and between ten and eleven at night he fell into a stupor, from which medical aid failed in recovering him. In this state he remained till half-past twelve next forenoon (Wednesday the 5th of August), when he breathed his last. His death, thus unexpected, at a time when it was hoped his life might have been spared for several years of increasing usefulness, and when his mental faculties were in full vigour, could not fail to excite a very deep interest; and many appropriate expressions of public regard were called forth, both in the pulpit and through the press.[2] It happened that a meeting of the commission of the General Assembly was held on the day of the funeral (the 12th), and, on the motion of the Reverend Dr Cook of St Andrews, a deputation, consisting of the moderator and several of the leading members, attended, as a suitable mark of respect due from the church to which he had been so zealously and consistently attached, and for which he had done so much by his writings. He was interred in the New Greyfriars burying-ground.

Dr M‘Crie was twice married. By his first wife (Mrs Janet Dickson), who died 1st June 1821, he left four sons and one daughter. His eldest son, Thomas, who has been for several years in the ministry, has recently been elected by the congregation as his father’s successor; and has also, upon Dr Paxton’s resignation, been appointed by the Synod professor of divinity. By his second wife (the daughter of his old friend and associate, the Reverend Robert Chalmers, Haddington), who survives him, he left no issue. A half-length portrait, from a picture by Mr Watson Gordon, S. A. to be engraved in mezzotinto, is in the course of publication, and cannot fail, as it is an admirable likeness, to be an acceptable memorial to his friends and admirers. A bust, also, by Alexander Ritchie, was in the last exhibition of the Scottish Academy. In this year (1836) a posthumous volume of “Sermons,” by Dr M‘Crie, edited by his son, has appeared, 8vo, pp. 393. A collection of his miscellaneous writings, with memoirs of his life by the Rev. Thomas M‘Crie, have likewise been announced for publication.

It is not necessary to enlarge upon Dr M‘Crie’s general character. In private life he was kind, affable, and free from every thing like display or desire of notoriety; being remarkable for his cordiality of manners, cheerfulness of temper and conversation, and his unaffected simplicity. As a preacher, his style of address was rather unprepossessing, partly from want of action, and partly from his slow, monotonous, and somewhat constrained delivery, as if afraid to speak out in the natural tone of his voice. But any deficiency of artificial eloquence was amply compensated for by his profound and luminous expositions of Scripture, expressed in clear and energetic language; and his discourses were uniformly of a practical nature, and breathed a strain of great piety. In his literary character, by which he will be known in after times, it will be acknowledged that his mind was of no ordinary cast. With extensive erudition, and habits of indefatigable research, he combined sound judgment, and a singular acuteness and sagacity of intellect. Could he have remained satisfied with the researches of previous writers, he might have produced a greater number, and perhaps more popular works, but they would not have borne the peculiar impress resulting from his own minute, accurate, and extensive inquiries, and therefore there is no occasion for regret that he should have devoted much of his time in exploring the original sources of information. His learning was both profound and extensive, as he was not only skilled in what are called the learned languages, but was conversant with most of those of modern Europe. Still, with all his natural love of literary pursuits, he kept such employment in subservience to his duty as a diligent and faithful minister of Christ. For nearly forty years he laboured with the most affectionate solicitude for the spiritual interests of his flock, and much of his time was devoted to them in his week-day ministrations. It was chiefly a consideration of the paramount importance of such a charge, we imagine, that caused him to decline the prospect of a chair in the University of Edinburgh, when a vacancy occurred in the professorship of Church History. There is every reason also to believe, that had his life been spared a few months longer, the honorary office of Historiographer Royal for Scotland would have been conferred, unsolicited, upon him, as a public testimony due to him. To conclude, the fame of Dr M'Crie as a literary writer has extended widely beyond the limits of his own country; and his name will probably be an object of greater regard in future times than even at present, though all his personal virtues are fresh in recollection. The profound research, the masculine vigour, and philosophic wisdom displayed in all his writings, added to the permanent interest of the subjects upon which the powers of his mind were usually employed, stamp them as works which will remain as landmarks in historical literature. (C. C. C.)

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[1] It may be noticed, that Dr M‘Crie, in May 1834, visited London to give his evidence before the Committee of the House of Commons on Church Patronage. His evidence forms part of the voluminous Report on that question, pp. 355-374, and 383-393.

[2] See *Blackwood’s Magazine*, and *Edinburgh Christian Instructor*, for September 1835. In the latter are extracts from the *Christian Herald*, &c. There has also appeared an eloquent Sermon, “occasioned by the death, and preached to the congregation, of the late Rev. Thomas M‘Crie, D. D.” on September 6, 1835, by Robert Shaw, minister at Whitburn, 8vo, pp. 30.

MACRIN, Salmon, one of the best Latin poets of the sixteenth century, was born at Loudun. His real name was John Salmon; but he took that of *Macrin*, from his having been frequently so called in ridicule by Francis I. on account of his extraordinary leanness. He was preceptor to Claudius of Savoy, count of Tende, and to Honorius the count's brother; and he wrote several pieces of poetry in lyric verse, which were so admired that he was called the Horace of his time. He died of old age, at Loudun, in 1555. *Charles Macrin*, his son, was not inferior to him as a poet, and surpassed him in his knowledge of the Greek tongue. He was preceptor to Catharine of Navarre, the sister of Henry IV., and perished in the massacre of St Bartholomew in 1572.

MACROBII, a people of Ethiopia, celebrated for their justice, and the innocence of their manners; also a people in the island of Meroe. The Hyperboreans were likewise called *Macrobii*. They generally lived to their hundred and twentieth year, and from their longevity they obtained their name (μακρος βιος, *long life*).

MACROBIUS, Ambrosius Aurelius Theodosius, an ancient Latin writer, who flourished towards the close of the fourth century. Of what country he was, is by no means clear. Erasmus, in his *Ciceronianus*, seems to think he was a Greek; and he himself tells us, in the preface to his *Saturnalia*, that he was *not* a Roman, but laboured under the inconveniences of writing in a language which was not natural to him. Of what religion he was, whether Christian or Pagan, is uncertain. Barthius ranks him amongst the Christians; but Spanheim and Fabricius suppose him to have been a heathen. This, however, is certain, that he was a man of consular dignity, and one of the chamberlains or masters of the wardrobe to Theodosius, as appears from a rescript directed to Florentius, concerning those who were to obtain that office. He wrote a commentary upon Cicero's *Somnium Scipionis*, and seven books of *Saturnalia*, which treat of various subjects, and form an agreeable mixture of criticism and antiquities. He was not an original writer, but made great use of other people's works, borrowing not only their materials, but even their language; and for this he has been satirically rallied by some modern authors, though rather unfairly, considering the express declaration and apology which he makes on this head, at the very commencement of his work. "Don't blame me," says he, "if what I have collected from multifarious reading, I shall frequently express in the very words of the authors from whom I have taken it; for my view in this present work is, not to give proofs of my eloquence, but to collect and digest into some regularity and order such things as I thought might be useful to be known. I shall therefore here imitate the bees, who suck the best juices from all sorts of flowers, and afterwards work them up into various forms and orders, with some mixture of their own proper spirit." The *Somnium Scipionis* and the *Saturnalia* have been often printed; and to them has been added, in the later editions, a piece entitled *De Differentiis et Societatibus Græci Latinique Verbi.*

MACROCERCI, a name given to that class of animalcules which have tails longer than their bodies.

MACROCOLUM, or Macrocollum (formed of μακρος, *large* or *long*, and κολλαω, *to join*), amongst the Romans, the largest kind of paper then in use. It measured sixteen inches, and frequently two feet.

MACROCOSM, a word denoting the great world, or the universe.

MACTAN Isle, a small island, one of the Philippines, situated to the east of Zebu Isle. It is noted as the place where Magellan was killed, A. D. 1521, on his return from America by a westerly course. Long. 123. 48. E. Lat. 10. 30. N.

MACTATIO, in the Roman sacrifices, signifies the act of killing the victim. This was performed either by the priest himself, or by some of his inferior officers, who were known under the name of *popæ*, *agones*, *cultrarii*, and *victimarii*; but, before the beast was killed, the priest, turning himself to the east, drew a crooked line with his knife, from the forehead to the tail. Amongst the Greeks this ceremony was most commonly performed by the priest, or, in his absence, by the most honourable person present. If the sacrifice was offered to the celestial gods, the victim's throat was bent up towards heaven; if to the infernal, or to heroes, it was killed with its throat towards the ground. The manner of killing the animal was by a stroke on the head, and, after it had fallen, thrusting a knife into its throat. Much notice was taken of, and good or ill success predicted from, the struggles of the beast, or its quiet submission to the blow; from the flowing of the blood, and the length of time the animal happened to live after the fall; and other circumstances.

MACULA, a bay of Arabia, on the northern coast, about two leagues deep and fifty broad, at the bottom of which is a small town. It is fifty-five leagues east-north-east from Cape Aden. Long. 47. 33. E. Lat. 14. 6. N.

MACUNA, one of the Navigator's Islands, in the South Pacific Ocean, where a captain and several officers and men under Pérouse were massacred by the inhabitants. Long. 169. W. Lat. 14. 19. S.

MADAGASCAR, an important and interesting island, on the eastern coast of Africa, separated from the mainland by the channel of Mozambique, which is nearly 300 miles broad. It is one of the largest islands in the world, extending from 12. 2. to 25. 40. south latitude, being above 800 miles in length from north to south, and varying in breadth from 120 to 300 miles. It is traversed from north to south by a double chain of mountains, some of which reach the height of 6000 feet above the level of the sea. Some of these elevations are the craters of extinct volcanoes, and have the shape of an inverted cone. These ranges divide Madagascar into two parts, approaching nearer to the eastern than to the western coast. The scenery is often very grand and picturesque, presenting high, abrupt precipices, luxuriant valleys, passes and ravines, immense forests, streams, and lakes. Numerous rivers have their rise in these mountains, which amply supply the surrounding country with water for the purposes of irrigation. Probably no country in the world is more plentifully supplied with this indispensable requisite. The most considerable of these rivers are the Murundava on the western side, and the Mananzari and Manangara on the eastern. The Andevourante is navigable for canoes to the distance of a hundred miles from the sea. The Manguru, one of the finest of them, rises from the lake Antsianaxe, which is seventy-five miles in circumference. Four other lakes, Rassoi-Be, Rassoi-Massaïe, Irangue, and Nossi-Be, extend along the eastern side, and communicate with one another.

This island is very rich in mineral productions, though these are turned to very little account. Iron ore abounds in considerable quantities very near the surface of the soil, and, when wrought, the metal is found soft and malleable, and equal to any in the world. The mountains contain tin and lead; and small quantities of pale gold and copper have been obtained. Immense blocks of rock crystal, some of them twenty feet in circumference, abound in the country; granite, very fine black agates, and many other less precious stones, are also found. Along the western part are numerous banks of mineral salt, which is to be obtained with very little labour.

The botany of the island still presents an almost unexplored field for the naturalist. From the fertility and marshy nature of the soil, vegetation in every quarter is most luxuriant. In the fields and forests are found many trees and shrubs, useful both in the arts and for the purposes of life. Amongst the most valuable are the sagou tree, the leaves of which are used to manufacture stuffs in high repute; two species of coffee tree; a plant called the ravinale, from which the inhabitants make many useful instruments; and several varieties of the cotton tree, particularly that known as the largest species. This country also furnishes some costly woods, such as sandal, black and white ebony, green and white spotted. The indigo plant, rice, and yams of several sorts, are also found, indigenous to the soil. Rice, of which there are eleven species, is the chief article of culture, and the principal food of the inhabitants. It is grown on the low lands, in the damp woods, and on the banks of rivers. After rice, manioc and batatas are most commonly cultivated for food, the roots of the manioc often measuring fifteen feet in length and one foot in diameter; the vine, sugar-cane, pine-apples, bread-fruit, sweet potatoes, plantains, Indian corn, prickly yam; tobacco, of which there are eleven species indigenous to the island; the arrow root, called by the natives tharoole; the Urania speciosa, the leaves of which are made to supply the place of dishes; allspice; negro pepper of the Indies; the angola pea, on which silk-worms principally feed; and the Sagus rufia, a species of pine, the fibrous part of the leaves of which are woven into garments, worn by the principal inhabitants. Indeed all the vegetables peculiar to tropical climates, and even those of Europe, have been here successfully cultivated.

The animals most abundant in Madagascar are horned cattle, which are very fine, and furnish inexhaustible wealth and food for the population. All these have bunches of flesh on their shoulders, those on bulls being exceedingly large. Hogs and poultry are bred, but less generally regarded. The elephant and lion are unknown, but an animal is found called the antaba, which appears to be a species of leopard; and another called farassa, somewhat resembling the jackal. Wild asses with very large ears, wild boars with horns, goats, sheep, a species of hedgehog proper for eating, and the bat, which is esteemed a delicacy, are also found in Madagascar. Alligators are numerous, and in some places their flesh is eaten, in others it is held in abhorrence. In the woods fowls are very numerous; the most useful are wood-pigeons, pheasants, geese, ducks, and parrots. Locusts sometimes darken the air, and are considered as excellent food by the inhabitants. The rivers swarm with fish; but they are infested with crocodiles, which often prove fatal to strangers.

With regard to the state of agriculture in Madagascar, we quote the following observations of a distinguished traveller who recently visited the island:—

"The island of Madagascar is very fertile, even to the highest point of land; but it is only slightly cultivated, owing to the slothful habits of the people, who raise barely sufficient crops for their own consumption, and who, untaught by frequent seasons of scarcity, never fail to indulge their idle and gluttonous propensities whenever opportunities for doing so occur; preferring a present gratification to the exercise of that wise forecast that would provide for the future. Agricultural labour is not here confined to the male sex; on the contrary, the greater proportion is performed by women. The only farming implement used is a spade weighing about five pounds, six inches wide and nine deep, with a handle from seven to ten feet in length of red wood. The rice-grounds are dug up into sods of about a foot square, and five inches thick. The soil is usually enriched with marl or common manure; and being then turned, is left exposed to the sun for eight or nine days, when water is thrown upon it, and it dissolves easily. Cattle are then driven over it, the rice sown, and the earth carefully levelled, the sowers all the while wading knee deep in mud. These men are by no means expert; but that is perhaps owing to the natural indolence and carelessness which pervades their general character. Rice is frequently half grown in low grounds, and afterwards transplanted to a more favourable situation; but it is not so good as that which has not been thus transplanted."[1]

The western coast of Madagascar was carefully explored during an expedition undertaken by command of the British government, and this will enable us to describe it pretty fully.[2] The first bay touched at by the expedition was St Augustine's, which is situated about 150 miles from

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[1] Holman, *Voyage round the World*, 1834.

[2] *Narrative of Voyages to explore the Shores of Africa, Arabia, and Madagascar*, performed in his Majesty's ships Leven and Barracouta, under the direction of Captain W. F. W. Owen, R. N. In two volumes. London, 1833.

Cape St Mary, the southern extremity of the island. It is large and spacious, and was formerly much resorted to by English vessels, principally engaged in the slave trade. Now, the intercourse of the people of St Augustine's is chiefly confined to the whalers, and an occasional slaver that touches at it, either for refreshments or an addition to her cargo.

Tullia Bay is formed by a long narrow reef, dry at low water, and having two channels, one communicating with St Augustine's, and the other opening to the sea nine miles to the northward. In every part it affords safe and commodious anchorage for the largest ships. In the vicinity of the bay the country is low, but at a short distance inland it rises into a lofty range of hills. From St Augustine's to Boyauna Bay the coast is almost an unvaried, low, marshy plain, irrigated by barred rivers, bounded by a line of sharp pointed coral masses, which are uncovered at low water. At a few places a complete archipelago of rocky islets is formed, which assume a variety of fantastical shapes, that of the cauliflower being most predominant. These coral islands are very numerous, but they seldom exceed one mile in circumference. To mariners unacquainted with them they are very dangerous, but to others they afford at all seasons a safe and commodious anchorage, the extensive group called the Barren Islands, in particular, forming excellent harbours; yet they are only worth resorting to for wood, being destitute of fresh water. The shore is thickly covered with trees of a stunted growth, above which, in the immediate vicinity of the sea, the elegant casuarina is occasionally observed. In the vicinity of the Bay of Boyauna the hills present a very luxuriant appearance. There are two rivers in this bay, each affording capacious harbours. Off the northern one, termed Makumba, lies an island of the same name, almost connected with the main land by sandy flats. It is of considerable size, but lofty, and presents in every direction a huge precipice, excepting in one small spot, where a deep rent in the rock admits of a dangerous pass to the summit, which is a perfect level; and on it are the ruins of two small buildings, supposed to be of Arabic construction.

The northern half of the west coast of Madagascar is indented by a series of bays, rivers, and harbours, so admirably adapted for commerce in every respect, that were the island inhabited by a civilized people, it would doubtless be resorted to by ships of all nations for purposes of traffic. With the exception of Bembatooka, these harbours are utterly neglected, except by an Arab dow that occasionally touches at them for the purpose of procuring sandal wood or jerked beef. The bay of Bembatooka is in reality the estuary of several rivers which fall into it from distant parts of the interior. It is seventeen miles in depth, and three and a half miles across at the entrance; but inside it widens to nearly eight, excepting about half way in, where the shores on each side approach and leave a narrow channel, through which the pent-up water rushes with so much violence as to have scooped out an abyss of sixty-three fathoms in depth. The shores are in general low, and clothed with mangroves; but in some places they rise into a lofty range of hills. The village which takes its name from the bay is inconsiderable; but Majunga, situated on the northern side of the bay, near the entrance, is a large straggling town, nearly a mile in extent, and containing a large population of Malegashes and Arabs. The Malegashes are described as a very fine race of men. The style of the buildings, like the inhabitants, is one half Arab and the other half Malegash. The slave trade, and a traffic with the Arabs in bees' wax, rice, and gums, formerly constituted the principal source whence Bembatooka derived its wealth; but these are either abandoned, or of little importance when compared with the extensive trade in bullocks now carried on with the Americans, who jerk the beef, preserve the tallow, and cure the hides on the spot. Notwithstanding the distance of the voyage, the Americans have found this a profitable speculation, and have established small shops, where are retailed a variety of assorted goods, which are exchanged for the minor articles brought for sale by the natives. They also have a large wooden building, with an enclosed space attached, in which they slaughter their bullocks.

The next place of importance in proceeding northwards is Majambo, which strikingly resembles Bembatooka, being of about the same dimensions and form, possessing a like chasm of deep water in the centre, and having, like it, several rivers at its head. This bay would appear to have been anciently inhabited by Arabs, as their tombs are still in existence on the summit of the small island of Manza, blackened by age, and fast mouldering to decay. Farther to the north is Nareenda Bay, the islands at the north entrance of which afford excellent harbours, and are approachable in almost every direction. Saucasse, the largest of them, is inhabited, and nearly covered with verdure; as is also that of Souhee, a stupendous rock upwards of two hundred feet in height. A group of lofty volcanic islands, together with two or three lesser islets, intervenes between Nareenda and Passandava, the broadest and deepest bay on the west coast of Madagascar, and possessing numerous fine harbours. The village of Passandava, situated at the head of the bay, consists only of a few half ruinous huts. Near to it the mountains which surround a stupendous and inaccessible peak called Matowla take their rise. Numerous islands are situated in the vicinity of this chaotic mass of chasms and craggy steeps. Some of them abound in large masses of hardened earths of different colours, incorporated and stratified with quartz and basalt, or lava resembling it, whilst in others abrupt hills and lofty mountains enclose a pleasing variety of fertile valleys. Amongst the islands with which the western coast of Madagascar is profusely studded, may be mentioned the East and West Minnow groups; but they merely present an assemblage of perpendicular rocks or patches of coral. The islands next of importance are the Seychelles; but as they constitute a dependency of the island of Mauritius, they will be described in that article.

The western coast of Madagascar having now been described, it is only necessary to remark, that nearly all the towns are situated on rocky promontories, where the air is salubrious, and water can be easily obtained. The principal tribes who inhabit the western coast of Madagascar are the Muques and the Seclaves, both warlike tribes, the former possessing the southern and the latter the northern parts of the island.

We now proceed to describe the east coast of Madagascar, which, along with the west, is divided into various provinces, ruled over by independent chiefs, and inhabited by various races of men. In proceeding southwards from Cape Ambre, the northern extremity of the island, the first place worthy of notice is Diego Suariez Bay, or British Sound, which is perhaps one of the finest harbours in the world. Few natives inhabit the shores of this bay, and these are miserably poor, and have only bullocks to give in exchange for fire-arms, which they are particularly anxious to obtain. On its eastern side, which is much exposed to storms, the trees are shrivelled, and so matted and interwoven together that they are quite impervious to man. The substratum of the surrounding hills is composed of sandstone and columns of madrepore, many of which latter form hollow cylindrical points; most of the others are apparently primitive rock of volcanic production, in heterogeneous masses, which seem to have been at some period in a state of fusion. Antongil Bay, and the neighbouring country, next demand attention. A considerable part of the coast in this quarter presents a bold aspect. Those hills which, in coming from the southern extremity of the island, compose the most distant and highest range, here rest upon the sea, forming several stupendous rocky promontories. The general appearance of the country indicates fertility, every height being covered with stately and luxuriant forest trees, whilst streams of fresh water issue from the rich valleys wherever they open to the sea. In the vicinity of Antongil Bay is the river Maransectzy, the banks of which are low marshy swamps, but covered with a great variety of valuable trees, the largest of which is the gum-copal; mangoes and bananas are plentiful; as also the water-melon, which totally envelopes several lofty trees with its magnificent white flowers; whilst the modesta, with its beautiful pendant blossoms, and warra, are seen in every direction. English cottons, woollens, arms, and ammunition, meet with a ready and profitable market upon this coast; bullocks, gum-copal, and many other native productions, being obtained in exchange.

Isle Madame St Mary is thirty-one miles long north-east by north, and from two to three miles in breadth. Its surface presents a succession of hills, from two hundred to four hundred feet high, with deep and in general narrow vales, thickly covered with brushwood and underwood. Twice the French formed a settlement on this island: but the first time, the climate obliged them to abandon it; the second time, they were all massacred by the natives. In 1821, they again took possession of it, but suffered severely from the climate. Isle Madame, a low coral islet, constitutes their citadel, to which they retire every night for safety. The harbour is small, but deep, sheltered from all winds, and has a good supply of fresh water. The natives are short, rather darker than mulattoes, with low foreheads, broad and flat countenances, large eyes, and capacious mouths. Their canoes are small, of the common form, and delicately made, yet they venture far from the land, and will attack whales, which they kill by means of drags to the harpoon line.

The fan-palm is very plentiful, and invaluable to the inhabitants: houses are entirely constructed of it, the stems serving as supporters, the leaves forming the sides and roof. There are several looms for weaving cloth, made of the fibres of the sago-palm leaf, which is extremely durable; the natives also traffic in shells, wax, and turmeric. Beasts and birds are neither numerous nor varied; but there is an abundance of fish and vegetables, which are the principal subsistence of the inhabitants. The soil is exceedingly fertile, and is capable of producing all the fruits of a tropical climate. The black population of St Mary's is from twelve to thirteen hundred, a portion of whom are slaves to the rest. They pay no duties to the French, and are governed by their own laws.

The places next of importance in proceeding southwards are, Foul Point and Tamatave, two excellent bays or roads. The town of Tamatave is situated in latitude 18. 10. S., and longitude 49. 31. E. The entrance is between reefs, and ships are exposed to east winds; but the anchorage is good. The town contains about sixty good dwelling-houses, besides a number of native huts; they are large, divided into chambers, and well thatched with the leaf of the ravinale. The walls and floors are neatly matted, and the apartments are generally kept in good order. Each house is surrounded by a palisade, which secures both its privacy and safety. The climate is considered as very unhealthy, especially during the summer months, that is, from November till March. Fevers are very common, and they are generally preceded by violent fits of shivering. There is no exclusive right of landed property at Tamatave, which is considered as common to the whole chieftainship, and every person is at liberty to cultivate at his pleasure any unappropriated spot of ground, which is considered as the cultivator's until the crop is gathered. There is no impost or tax of any description, either on land or its produce. The children inherit, without dispute, any thing of which the parent dies possessed; but a free gift to the king of the northern peninsula is expected from the heir, according to his circumstances. The chieftain may, in cobar or council, concede landed property to strangers. The French had an establishment for salting meat here during the war, and Mauritius and Bourbon were supplied with it from this place. Bananas and plantains are abundant; and, when dried in the smoke, they are excellent, and will keep for any length of time. Locusts of a very large species abound here, and they are greatly esteemed by the natives as food. These insects, however, often prove very destructive to the crops, devouring all vegetable matter with astonishing rapidity.[1]

This part of the country is the most frequented by Europeans, who make large purchases of rice and cattle from the natives. It is or was termed the province of Bestimessaras, and is governed by malates, or chiefs of white extraction, who tyrannize over the people. They are looked upon as the handsomest men in Madagascar, but dissembling, drunken, cowardly, and addicted to theft. Farther to the south we meet with the Betanimenes or Sicouas. This country is the finest and most fertile of all the provinces situated on the sea-coast, and the inhabitants are very mild and sociable. Betanimenes owes much of its fertility to the river Andevourante, which is named after the capital, a pretty large town, and capable of furnishing a considerable number of armed men. The province of Antaximes is the last which is situated on the eastern coast of the island. The soil is good, but the cultivation of it is much neglected by the inhabitants; indeed this is the case throughout the whole island. The bay of Port Dauphin is large, and the anchorage is good. The town, which is of the same name, is of considerable size, and is the residence of a native chief, Ramananoulouna, whose power is absolute in this part of the island. After the death of Radama, king of Ovah (an important province, afterwards to be described), the widow of the deceased espoused Ramananoulouna; but, in 1829, this capricious individual declared himself independent of the reigning queen, and established himself in this distant part of the country. He has a considerable military force, well accoutred, and furnished with muskets. The produce here is nearly the same as in other parts of Madagascar; the staple commodities being rice and bullocks, which are exchanged for manufactured cottons, old cloths, and the like articles, which are brought principally from Bourbon. The only manufactured goods are guard-chains, grass cloths, mats, and baskets. The huts of the inhabitants are composed of stakes driven into the ground, the sides and tops being covered with fern leaves and grass. There is no distinctive fashion in the dress of the sexes, nearly all wearing no more than a cloth tied round the waist. The higher classes, however, and those connected with the court, including the soldiers, are attired in a very showy manner.

By far the most important part of Madagascar is that part of it occupied by the Ovahs, a race who inhabit the interior. This people owe the superiority which they have obtained to Radama, the first chieftain belonging to the island who assumed the title of king. He was an interesting and extraordinary man, the Mehemmed Ali of his country; but a more particular account of him will be introduced after the province has been described. It is alternately hilly, mountainous, or swampy and poor, though many places are rich in rice-grounds, pasturage, and the like, and much of the land is capable of extensive cultivation. As most of the animal and vegetable productions formerly mentioned as belonging to the island generally are found here, it is unnecessary to advert to these again. The ground is well watered by a number of streams, rivers, and lakes, but is in most parts destitute of fine timber, though there is much long grass and underwood. The fuel of the people is grass, moss, cow-dung, and in some places brushwood. Their food is rice, sweet potatoes, manioc, plantains, beef, wild fowls of the guinea species, which are everywhere in great plenty, fish, wild hogs, monkeys, and the like. In general they eat very little animal food, but live chiefly on vegetables.

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[1] *Voyage round the World*, by James Holman, vol. ii. p. 486, 1834.

The Ovahs are in height rather above the European standard, portly in their person, of shades of colour varying from deep black to copper (the latter colour, however, being most prevalent), with good-natured countenances. They are clothed only with an upper and lower garment, the saimbou and seddick; the former being a sort of robe, with which they partially envelope the body, wearing it in the manner of a scarf, the men throwing one end over the left shoulder, to give freedom to the right arm, whilst the women throw it over the right; the seddick, or under garment, is called also langouti. They generally carry in the right hand a zazaie, that is, a lance of about six feet in length, of polished wood, and very straight, terminated by a javelin blade, and shod with iron; and they are particularly fond of decorating their persons with silver and glass bracelets and rings, and with amulets or charms, especially the teeth of the cayman, a species of crocodile found in the rivers. Some wear plain, and others ornamental, head-dresses. A few of the chieftains carry the adze or battle-axe, and some of them are provided with shields.

Their dwelling-houses are generally small, that is, about five feet high to the wall-plate, fifteen feet long, and twelve feet wide. The frame-work is of round timber, easily selected for the purpose, and thatched with the zouzoura, which is the papyrus or paper-plant of the ancients, or with a reed called hayrana.

The villages are for the most part built on small eminences in the neighbourhood of good water, and contain from a small number to sixteen hundred houses. They are guarded against hostile invasions by having one, two, or three ditches surrounding them, as well as by being enclosed by a stockade fence. Each family occupies a separate building; and their household furniture consists of some baskets, a cushion on which to sit, a mat to lie down on, with a matted bolster for a pillow, cooking-vessels made of potter's clay, which the soil produces, a felling-axe, wooden pestle and mortar for taking the husks off the rice, a winnower, and a loom for making cloth. Thanaan-arive, the capital, is situated at an elevation of 4000 feet above the level of the sea, in latitude 18. 56. south, longitude about 47. east, and is 160 miles from the nearest coast.

The other tribes consider the Ovahs as a powerful and industrious people, and look up to them as superior, from the knowledge they possess of manufacturing silken and cotton saimbous and seddicks, the forging of iron, and applying it to different purposes, from the blade of the zazaie or lance down to a needle, and the making of silver and gold chains, balances, and other articles wherein great ingenuity is displayed.

The commerce of the capital is chiefly carried on by means of a very considerable river called Betsibooka, which, about fifteen miles from its mouth, expands over a wide extent of country, encircling small islands, and emptying itself into Bembatooka Bay, which, at its entrance, is free from rocks and sand banks. Boats are able to proceed 160 miles up the Betsibooka, to a place called Mahatsara, where two other rivers fall in, in latitude 17. 33. south; thence the trader has only a distance of about eighty-five miles to travel overland to the capital. One of the principal impediments to intercourse with the Ovah country arises from the want of beasts of burden, no use being yet made of cattle for this purpose. Were these employed, the different provinces of the island might be greatly improved. Not only might rice and corn be cultivated to a prodigious extent, but the treasures of the earth, such as iron-ore, potters' clay, plumbago, and tin, might be easily obtained; and more attention might also be paid to the breeding of cattle. The Ovahs carry on a trade both by barter and with money; that by barter consisting chiefly of rice and cattle, which are exchanged for arms, clothes, and ammunition; that by money, of all sorts of other things, as scents, baubles, and the like. They are very superstitious, place the utmost confidence in divination, and their wise men exercise great influence over them.

It only remains to say a few words regarding Radama. This prince reduced to subjection the largest and finest part of the island. He held many cobars or public meetings, at which he required the attendance of all his conquered or submitting subjects, at which time they took the oath of allegiance or fidelity to him. On these occasions he proclaimed himself king of Madagascar, made known his laws (which he greatly reformed), and the terms on which he protected the subject, which were submission, and the payment of a tenth of their property. He abolished the slave trade, both in exportation and importation, and punished either with death. He greatly encouraged commerce, and through the medium of trade had, as early as 1817, obtained twenty thousand stand of arms, with which he equipped his troops; and he rendered his army still more formidable by adding to it a train of artillery. A number of young natives were sent by him to Paris and London to obtain instruction, and by the aid of the English missionaries he established a printing press. Numerous teachers were under his auspices trained and distributed throughout different parts of the kingdom. Unhappily this prince was, in the year 1828, poisoned by his wife, who raised a worthless paramour to the throne; the same individual who has already been mentioned as having established himself at Port Dauphin. The death of Radama has introduced great anarchy, inducing several subject states to shake off the yoke which he had imposed upon them, certainly for their own ultimate advantage; and there seems now every reason to fear that the career of improvement which was begun under such favourable auspices will be arrested. A native prince, with talents equal to those of Radama, rarely appears in a semi-barbarous country.

The observations which follow apply to Madagascar in general, not to Ovah in particular. The form of government throughout the island is democratic; consequently all matters of public importance are settled in the council or cobar, which is composed of all the male persons who choose to claim a seat there. The cobar is also their court of justice, and the only one in the chieftainship; its decisions in criminal cases are final, but not always in cases that respect the rights of property, these being frequently referred to some neighbouring chief, whose opinion is thought impartial, and his decision is always conclusive. All crimes, except that of murder, are punished by fine, which, if not paid by property, must be liquidated by personal labour, the criminal being constituted the slave of the accuser. Murder is punished by inflicting upon the culprit the same death that he perpetrated upon his vic-

Madagascar.

tim. Inflicting an intentional injury upon a person is punishable in the same manner. Circumcision is universally practised; but it is not confined to any particular age, although it generally takes place when the child is about ten months old, and seems only dependent on the pleasure of the parents, or upon contingent circumstances. The adornment of the person about to be circumcised is one of the most indispensable parts of the ceremonial; but there are many others which are whimsical and amusing enough, as feasting, dancing, and singing. The ceremony of marriage is very simple; amongst the slaves there is none at all beyond the master's consent and the mutual promises of the parties themselves; neither is the tie considered as binding. The offspring are bond or free according to the condition of the mother. Amongst the higher classes, the consent of the parents is considered as an essential point; and the marriage is effected at a family meeting, when the elder people give advice to, and express good wishes for, the young couple, frequently accompanied with more substantial proofs of their esteem. Polygamy is allowed, and extensively practised. Separations are not unfrequent, being lawfully permitted; after which the parties are allowed to marry again; otherwise, adultery is punishable, but not with death, except where a member of the royal family is concerned, particularly the wife or mother of the king. The succession to the crown is hereditary; yet, by an ancient law, it is only permitted to be so in the female line, that is, the king's sister's eldest son. Slaves are very numerous in the country. Criminals of sundry descriptions are liable, with their wives and children, to be sold into bondage. Their lot, however, is not very severe, as they are employed entirely in ordinary and domestic occupations; and are, in reality, mere menial servants and labourers, eating and living with their owners whilst they conduct themselves well; when they do otherwise, they are sold as a punishment. Thirty or forty dollars are the common prices for good men slaves. With regard to religion, little that is satisfactory can be said. An attempt has lately been made to introduce Christianity, but, we fear, with small success. Radama encouraged the missionaries and patronized their schools, which at one time were numerously attended, and bade fair for the extension of civilization; but they have met with opposition and persecution from his worthless successor. In some places Mahommedanism prevails, but for the most part the people are under the bondage of Ompamousavous (sorcerers, or wise men), who celebrate certain heathenish rites, which it is unnecessary to describe. Although there is a mixture of Arabs and Moors, if not Jews, amongst the inhabitants of Madagascar, yet the great majority of the inhabitants have either a tawny complexion and the smooth hair of the Indians, or a black skin and the frizzled hair of the Caffres, which leads us to infer that the island was anciently peopled by emigrations both from Caffraria and Malabar. The name of Malegashes, assumed by the ancient inhabitants, and still in use, that of Mal-Dives, of Mal-Bar, and others, point out this descent, which, as far as regards the Asiatic emigration, is still more completely demonstrated by the composition of the prevailing language of the country. With regard to the Madecasse language, Malte-Brun observes, that "the language affords some Arabic words, and others more nearly resembling the idioms of the Caffres; but its principal roots may be traced in the Malay, or in the dialects derived from that language, and spoken at Java, at Timor, in the Philippines, in the Marian Isles, and in all the archipelagos of North and South Polynesia. Many of the most remarkable natural objects, and the days of the week, have the same names in the two languages. There is the same want of declensions and flexions, the same mode of uniting words, the same abundance of vowels. Notwithstanding what has been advanced by the learned continuator of the German Mithridates, we can affirm that the Madecasse appears intimately connected with the Malay language, and particularly with the Javanese and Timorian."

Madalena || Madeira.

It does not appear that Madagascar was known to the ancients. Some indeed have supposed that it is obscurely indicated in the book *De Mundo*, ascribed to Aristotle under the name of *Phanbalou*, and in the Periplus of the Erythrean Sea, under that of Menouthesias. It is supposed to be described by the Arabian geographers under the title of the Island of the Moon. During the middle ages it seems to have fallen, along with all the eastern coast of Africa, under the dominion of that people, whose posterity still form a leading class amongst the inhabitants. In 1506 it was visited by Tristan d'Acunha, but being found destitute of the precious metals, and without spices, it attracted little attention. A fine field of commerce is opening on the island for British enterprise, if conducted with honesty and good faith. The Malegashes have in general a great aversion to the French, who have repeatedly attempted, by force or fraud, to form settlements on their island, and who have often enticed them on board to trade (they being very fond of commerce), set their canoes adrift, and taken the owners of them into slavery. An instance of this kind occurred so recently as 1825. Nothing certain can be said as to the number of inhabitants; the most probable conjecture is, that they amount to about 2,000,000. By some travellers, however, the population is estimated at 5,000,000.

MADALENA, LA, an island in the South Pacific Ocean, about eleven leagues in circuit. It is very populous. Long. 141. 9. W. Lat. 10. 25. S.

MADEIRA, an island situated off the western coast of Africa, about fifty-four miles in length by twenty-one in breadth. It is a country of rocks, consisting of a number of lofty mountains, on the declivities of which all the productions of the island are raised. The best account of the island is that by the late Mr Edward Bowdich, whose journey over the island we shall follow. The country at the back and sides of Funchal, the capital, presents the broken outline of a segment of a vast natural amphitheatre of basaltic peaks and mountains, rising to 3800 feet behind the Mount Church, which is the most striking edifice in this beautiful landscape, and is elevated 1900 feet above the sea, presenting the most picturesque breaks and vistas, intersected by ravines and torrents, and covered with undulating and rugged ridges and sheets of basalt, diverging from the more central heights, and descending boldly to the sea. The basalt is both columnar and granular; the former is, generally speaking, compact, of a broad conchoidal fracture, splitting in horizontal laminæ, or at right angles to the prism, dark gray within or on the surface of a fresh fracture, which becomes covered with a superficial decomposing coat of brownish red, with age-inducing brittleness, and passing ultimately into yellowish white and dull brown; a moderately thin plate of the columnar basalt, when covered exteriorly with red powder, will snap between the fingers. The next place of importance is the Peak of Ariero, about three hours' ride from Funchal. The latter part of the ascent is along the barren rocks of basalt and red tuffa, which form the highest outline of the view behind from Funchal, and are 3700 feet above the sea. The peak is 5446 feet above the level of the sea, and is covered with vegetation to the top. The Coural, or sheepfold, is an immense valley near the village of Comera de Lobos, completely surrounded with almost perpendicular hills, and in no part less than 1000 feet in height. Round a part of three cliffs is a narrow road, winding along the brink of the precipices, often cut out of the solid rock, across peaks and gaps which were formerly impassable. This road has been of great importance in connecting the interior of the island with the sea coast, and useful for transporting the productions of the country to the capital.

The soil in every part is extremely fertile; the hills are covered with a luxuriant vegetation; and the finest flowers, sometimes of aquatic species, are found growing on the summits, being supplied with a moisture from the constant vicinity of the clouds. Trees and shrubs of the finest kinds are everywhere found in great abundance; and tropical plants which have strayed from the gardens soon become perfectly naturalized to the soil. The Portuguese formerly procured their principal supplies of sugar from this place; but not being able to compete with the West Indian planters, the inhabitants betook themselves to the culture of the vine, which has since become the chief product of the island. It is said that plants of the vine were conveyed from Crete to Madeira in 1421, and have since succeeded extremely well. There is considerable difference in the flavour and other qualities of the wines of Madeira; the best are produced on the south side of the island. The method of cultivation most generally followed is to trench the ground from three to seven and even nine feet deep, according to the nature of the soil, and lay a quantity of loose or stony earth at the bottom, to prevent the roots from reaching the clayey soil beneath, which would otherwise oppose their growth. The ground is watered three times if the summer has been very dry, the sluices being left open until the ground is pretty well saturated; the less the ground is watered the stronger the wine, but the quantity is diminished in proportion. The vines are found to bear fruit as high as 2700 feet, but no wine can be made from it. Wheat, barley, and rye are produced, but scarcely amount to one fifth of the quantity annually consumed. Wheat is sown in October and reaped in June; and the crop is followed by beans or sweet potatoes. The chestnut-tree has been introduced, and forms the principal timber of the island, and affords the chief food of the peasantry. Rice is cultivated, but more as ornamental grass than for any useful purpose. Pine and custard apples, and various other fruits, are grown in the open air in considerable quantities. In consequence of the land rising to a great elevation, this island presents great diversity of climate, though, upon the whole, it is mild and healthy. The rainy season comprehends the months of October, November, December, and January, although the dry weather during the first two months generally exceeds the rainy. The prevailing winds during this season are from the west and the south-west. In the dry season the prevailing winds are from the north-east, and they are not saturated with humidity like those which blow over the equinoctial seas. Although vegetation is so great, the pasture is scanty, and only capable of maintaining a small number of cows, which renders the productions of the dairy objects of luxury. A few oxen are used in the towns; but the mule is the most common beast of burden, and is best adapted for carrying goods along the narrow paths of the mountains. There are abundance of goats and hogs, which being allowed to run wild, acquire a resemblance to venison in taste; rabbits are very common in mountainous districts. Myriads of lizards inhabit the gardens and vineyards, and do considerable damage amongst the refined grapes. Bees abound in hills and valleys, and produce a honey of peculiar delicacy, from the numerous aromatic herbs on which they feed. The population is thought to be at present (1816) about 100,000, though some accounts represent it as much greater. From the extent of the island, and the rocky nature of the land, this census is very great. The inhabitants have evidently sprung from various sources. Amongst the richer inhabitants and merchants are found natives of almost every commercial country, but the greatest number are British. These hold little intercourse with the other inhabitants, but live in a state of luxury among themselves, and show great hospitality to strangers visiting the island. The peasants are generally of Portuguese descent, who, amidst the plenty which surrounds them, live in a state of great poverty. In appearance they are tall, well made, but meagre, with gloomy looks and long black hair; and they are very polite. Their dress consists of white linen trousers, made very wide, over which are drawn boots of buff leather; a coarse white shirt open at the neck, displaying their sun-burnt breasts; a blue cap and jacket, ornamented with silver buttons; and in winter they wear long cloaks. The females are condemned to severe labour: whilst the males are engaged in the vineyards, it is their duty to procure fuel, and often to carry loads of it to the city to dispose of for their subsistence, besides other households toils. They are generally of hard, yet not disagreeable features, with high cheek-bones, dark complexions, and rather large feet; their bodies, however, are well proportioned, and their eyes are lively, large, and black. The want of animal food is severely felt by the peasantry, the most hard-working labourer being constrained to live almost entirely upon bread, roots, and fruits. They extract from the husks and stalks of the grape, after they have passed through the wine-press, a kind of small beer called *aqua pé*, which, when fermented, acquires some degree of tartness, but will not keep.

The capital, Funchal, is a considerable town, situated in the centre of a large bay. It is built on the declivity of a hill, and the streets are kept clean, being watered by streams from the mountains. The bay is not very secure for anchorage, and is even dangerous during south winds. The landing is difficult, owing to the great surf which breaks upon the shore. It is strongly fortified towards the sea; but the defences on the land side have been greatly neglected. The wealthier inhabitants are generally British merchants, engaged in the wine trade. It is situated in long. 17. 6. W. and lat. 32. 37. N.

Adjacent to Madeira is the island of Porto Santo, about six miles long and two and a half broad. It is high and rocky, composed principally of sandstone, and a calcareous tuffa of a greenish-gray colour. The vine is cultivated in considerable quantities, and the soil yields good crops of wheat, Indian corn, barley, and beans. The population is estimated at 1400, and there are 300 militia. It possesses a good roadstead, but the landing place is bad. The Desertas are small uninhabited islands, which, with Madeira and Porto Santo, form the group called the Madeiras.

These islands were first settled by the Portuguese; but a tradition exists of their having been visited by an English gentleman, and lady to whom he was attached, who were left behind by accident, and both died there soon afterwards. It has belonged to the Portuguese ever since, and was considered as of such importance to the commerce of this country, that, during the late war, it was held in trust by Great Britain for her ally.

Its commerce consists almost entirely in the export of its wine. The principal quantity is sent to Great Britain, the East and West Indies, and America; but from frequent adulteration, and the preference of French wines, the trade is not now so great as it formerly was, the growth of the island not exceeding 20,000 pipes. The best is that known by the name of London particular, the second London market; and there is also a very rich sweet wine called Malmsey. The quantity of Madeira wines imported into Great Britain in 1833 was 301,057 gallons; of this, 161,042 gallons were retained for home consumption, and 209,194 exported. The price of these wines in London varies from L.18 to L.80 per pipe, according to the quality. There is also a considerable trade carried on in supplying with provisions ships which generally call at this place on the voyage to India.

MADEN, a town of Armenia, on the Tigris, so named from the copper and iron mines in its vicinity. Its situation is very striking and singular, being surrounded on all sides by bleak and barren mountains of great elevation, and overlooking a prodigious chasm, through which the Tigris forces a passage. It is sixty miles north of Diarbekir.

MADGHERY, a hill-fort and town of Hindustan, in the rajah of Mysore's territories. Long. 75. 15. E. Lat. 13. 33. N.

MADIGHESHY, a fortress of Hindustan, in the Mysore rajah's territories, situated on a rock of very difficult access, at the foot of which is a town containing near 200 houses. Long. 77. 16. E. Lat. 13. 48. N.

MADIRAN, a market-town of France, in the department of the Upper Pyrenees, and arrondissement of Torbes, with 1130 inhabitants, who grow excellent wine.

MADNESS. See MENTAL DISEASES.

MADRAS, a city of Hindustan, in the province of the Carnatic, and the principal settlement and capital of the East India Company in the southern peninsula of India. It is situated close to the margin of the sea, and is a fortress of great strength. In appearance Madras differs widely from Calcutta, having no European town, except a few houses, which are chiefly used as warehouses in the fort. The European residents, mostly the servants of the Company, live entirely in their garden-houses as they call them, which are all so closely planted that the neighbouring dwelling is rarely visible. They repair to the fort in the morning for the transaction of business, and return thence in the afternoon. These garden-houses are very neat buildings, being mostly of one story, and having a handsome balcony supported by pillars in front, with green Venetian windows. The fort itself, called Fort St George, is handsome, strong, and not too large; and, although not of so regular a design as Fort William, yet, from the greater facility of relieving it by sea, and the natural advantages of the ground, which leaves to an enemy no choice in the manner of conducting his attacks, it may, on the whole, be deemed equal to it; besides that it may be defended by a less numerous garrison. In the middle of the present fortress stands the original one, a small square, now mostly converted into government offices, and the town residences of some of the civil servants. The nabob of the Carnatic has also a palace called Chepauk, situated on the Chaultry Plain, at a little distance from the esplanade. The Chaultry Plain, once the scene of Tippoo's devastations, when he descended from the Ghauts, and, sweeping the low country with his cavalry, carried dismay to the walls of Fort St George, commences about a mile and a quarter south-west of this fort, from which it is separated by two small rivers; the one the river Triplicane, winding from the west, and gaining the sea about a thousand yards to the north of the glacis; the other coming from the north-west, and passing round the high ground of the western side of the Black Town, and continuing to the east within a hundred yards of the sea, where it washes the foot of the glacis, and, running for some time parallel with the beach, finally joins the Triplicane at its mouth. This plain extends two miles to the westward of the enclosures which bound the St Thome road, and terminates on the other side at a large body of water called the Meliapoor tank. It is now covered with the garden-houses of the European settlers, who have converted a barren sand into a beautiful scene of vegetation. The government-house is situated in the Chaultry Plain, on the edge of the esplanade, and has the advantage of not being quite shut up, having a pleasing view of the sea, and of Fort St George. The house itself is large and handsome; the floors, the walls, and the pillars, are of the most beautiful chunam of different colours, almost equal in splendour to marble itself. The roads are a great ornament to the place, being broad, and shaded on each side by a noble avenue of trees. To the southward of the fort stands the church, at the back of which is the residence of the governor. To the northward of the old fort stands the Exchange, on which, in 1796, a light-house was erected, the height of which is ninety feet high, and it is visible from the sea at the distance of seventeen miles. The botanical garden, reared at a vast expense by Dr Anderson, was nearly destroyed by a violent hurricane on the 9th of December 1807, and is now in a state of decay. In November 1803, a navigable canal was opened from the Black Town to Ennore River, which communicates with Pullicat. It is 10,560 yards in length, and thirty-five feet wide by twelve feet deep. By this channel boats go to Pullicat, whence Madras is supplied with charcoal. The Black Town of Madras stands to the northward of the fort, from which it is separated by a spacious esplanade. It is nearly four miles in circuit, and was formerly surrounded with fortifications sufficient to resist a surprise from a body of horse; but, owing to the tranquillity that prevailed in the country, these have long been neglected. It has some good streets and bazars; but the streets are not regular, nor are the houses uniform: some of them are large brick buildings with flat roofs, but the greater part are built of mud, with tiled roofs. It makes a better appearance from a distance than when it is closely inspected. The Black Town is the residence of the native Armenian and Portuguese merchants, and also of many European settlers not the servants of the Company.

In Lord Valentia's account of Madras, it is observed, that it would probably have been difficult to find a worse place for a capital than that chosen for Madras, on the extreme point of a coast where the current is most rapid, and where a tremendous surf breaks even in the finest weather. But the original error of fixing on this for the site of a great capital cannot now be recalled, the expense of removal to a more convenient spot would be so great. Owing to the exposed situation of Madras, it affords no secure anchorage; and there is always a great difficulty in landing from vessels, which generally moor in nine fathoms, with the flag-staff west-north-west, about two miles from the shore. Any ship's boat that should attempt to cross the surf would inevitably perish; and, accordingly, the boats from ships anchor outside the broken water, and wait for the country boats to carry the passengers safely to the shore. These boats are of a particular construction, being built of soft wood, with flat bottoms. They are sewed together, and have not a nail in their whole construction, so that they are very light and pliable, and are borne many yards through the surf without injury, as they yield to the waves like leather. These boats require to be guided by seamen of experience and tried skill, and it is an extremely critical operation to conduct them through the surf. When they come within its influence, the cockswain stands up, and, under great agitation, marks time with his voice and his foot, whilst the rowers work their oars backwards until overtaken by the swell, which, curling up in its approach to the shore, sweeps the boat along with fearful violence. The rowers now ply every oar forward with their utmost vigour, to prevent the wave from carrying back the boat with its receding swell; and by a few successive surfs the boat is at length dashed high and dry on the shore. A species of floating machine called a catamaran, formed of two or three light logs of wood, eight or ten feet in length, lashed together with a small piece of wood inserted between them to serve as a stem-piece, is employed by the fishermen and lower classes of natives to carry them through the breakers. On these they go out to fish, or to carry letters or small quantities of refreshments to ships when no boats can venture out. They secure the letters in a pointed cap, where they cannot be damaged; and when the men happen to be washed off by the surf, they regain the catamarans by swimming, unless when they are attacked by a shark. The dexterous navigators of these frail vessels who distinguish themselves by saving persons in danger, or by their care in conveying papers through the surf in dangerous weather, are rewarded with medals.

Madras, when seen from the sea, presents a striking appearance, the fortifications of Fort St George being within a few yards of the shore; and, at a distance, minarets and pagodas are seen mixed with trees and gardens. The public offices and storehouses are fine buildings, with colonnades to the upper stories, supported on arched bases, covered with beautiful shell-mortar from Madras, which is hard, smooth, and polished. These being near the beach, which is always crowded, form interesting objects. At a distance, the low, flat, sandy shores extending to the north and south, and the small hills that are seen inland, give an appearance of barrenness, which, however, improves on a closer inspection. Madras is surrounded by a level country, which in general exhibits a naked, brown, dusty plain, with few villages to enliven the scene, or any other objects to relieve the eye, except a range of abrupt detached hills to the south. The huts of the natives are covered with tiles, and are fully superior in their appearance to those in Bengal; and in the inns and chaultries, also, which are common on the roads, travellers experience greater attention. The soil in the vicinity of Madras is very poor, and formerly provisions were scarce and dear; but since the great accession of territory that has accrued to the Madras presidency, they are brought from the Barramahal and other parts of the country in great abundance. The soil, however, when it is cultivated, and where there is abundance of water, produces a good crop of rice; and artificial irrigation often makes up for natural disadvantages. The cattle that are found in the neighbourhood of Madras are a small breed, such as are commonly seen in the Deccan; but they are larger than those in the southern parts of Bengal. Buffaloes of a small size are generally used in carts.

The manners of the Europeans at Madras, the state of society, and style of living, are nearly the same as in other parts of India, except that provisions are more expensive. Within doors, dinner parties, and, during the cold season, monthly assemblies and balls, constitute the routine of amusements. Amongst the public places of resort is the Mount Road, leading from the fort to St Thomas's Mount, which is quite smooth, and embellished on each side with banyan and yellow tulip trees. Here it is customary for the fashionable parties in Madras to repair, in their gayest equipages, during the cool of the evening, where they drive slowly about the cenotaph which is here erected to the memory of Marquis Cornwallis, and converse together. During the hottest part of the day, namely, after two o'clock, which is the time when tiffin or the real dinner is eaten, many retire to rest until five o'clock, when the master of the family returns from the fort, and an excursion to the Mount Road, and dinner, then occupies the remainder of the day, unless it be prolonged by a ball and supper in the evening. The morning, from nine to eleven, is the time for visiting, when the European residents call on each other, retail the news, and offer their services to their friends in the city, to which they must repair for purposes of business. Another tribe of visitors succeeds, and thus the forenoon passes away.

European passengers, when they land at Madras, being ignorant of the language, manners, and customs of the country, necessarily rely on the natives for help; and, accordingly, passengers landing at Madras are immediately surrounded by numerous servants of all kinds, called dobashies, eager for employment. They undertake to transact for the Europeans all their necessary business, to buy all that is wanted, and to procure servants, tradesmen, palanquins, and the like. They are of different castes, according to the nature of the duties which they undertake to perform.

Madras carries on a very considerable trade, not only with Europe, but with China, Ceylon, Pegu, the Isle of France, New Holland, and different parts of India. But, owing to the want of a navigable river, and the difficulty of landing goods, it labours under great disadvantages, and its commerce is inferior to that of the other two presidencies. From America the imports are some inferior sorts of wines, spirits, and provisions. Rice is imported from Bengal, also raw silk, canvass, piece goods, muslins, and shawls of a coarse description, silk piece goods of an inferior kind, long pepper, sugar, borax, saltpetre, precious stones, &c. From Bombay are imported, through the Persian and Arabian Gulfs, dried fruit or drugs, cotton and other goods; from Ceylon, biche de mer, shark fins, ebony, &c. also pearls; from China, tea, sugar, nankeen, China ware, with alum, camphor, drugs, piece goods, stationery, &c.; from Manilla, indigo; from the Isle of France, brandy, copper, iron, lead, &c.; from Pegu, the staple article is timber; from the Malabar coast, pepper, timber, coir, cordage, &c.; from London, different articles of European manufacture, in glass, iron, copper, tin, and other manufactures, also supplies of wine and other necessaries; from Madeira, wine. The exports of Madras consist of piece goods to America; to Batavia, piece goods of a coarse coloured sort, handkerchiefs, and a proportion of southern blue cloths; to Bengal, some red wood, coloured piece goods, and salt; to Bombay, chintz and coloured turbans to an inconsiderable amount; to Ceylon, principally European and China articles; to China, principally cotton; to Manilla, piece goods, namely, cambays, handkerchiefs, &c.; to the Isle of France, chiefly long cloths, handkerchiefs, muslins, ginghams, &c.; to Pegu, coarse handkerchiefs, and copper, arrack, brandy, mace, cloves, iron, glass ware, naval stores, &c. which are re-exported. It does not appear that the trade of Madras, which is really the trade of the coast of Coromandel, is increasing. For this several causes are assigned. Amongst these are various oppressive inland taxes, which obstruct the progress of improvement. Owing to the former monopoly of the East India Company, the raw silks and nankeens of China, which could not be exported directly to Europe, were brought to Madras, and thence re-exported. They are now directly exported from Canton, and the trade is consequently lost to Madras. The value of the exports and imports of Madras, in bullion and merchandise, was in 1813–14 L.695,373, and in 1828–29 L.788,959, thus exhibiting during this interval only the trifling increase of L.93,586.

Considerable variety of coin circulates in Madras and its vicinity. Of the gold coins, the principal are, star or current pagodas, value 7s. 5½d. or 8s. The gold rupee, new coinage, is worth L.1. 9s. 2d. The Arcot rupee, and the new silver rupee, are worth 1s. 11½d., and 1s. 11⅓d. The accounts are kept in star pagodas, fanams, and cash; eighty cash make one fanam, twelve fanams one rupee, and forty-two fanams a star pagoda. The natives keep their accounts at twelve fanams sixty cash to a rupee, and forty-four fanams sixty cash to a pagoda. The current coins consist of various sorts of pagodas, Arcot rupees, single and double fanams, and copper coins of twenty, ten, five, and one cash each, called dodees and half dodees.

The English possessed no fixed establishment here until A. D. 1639, when they received a grant from the Hindu dynasty of Bijanagur, then reigning at Chandergherry, permitting the erection of a fort. In consequence of this permission, Mr Day proceeded with great alacrity to the construction of a fortress, which in India is soon surrounded by a town; and this town he allowed to retain its Indian appellation, but the fort he named Fort George. The territory granted along with it extended five miles along shore, and one mile inland. For about a century, Madras, with the small portion of territory adjoining, continued to be held by the Europeans, but rather under, or at least with the consent of, the native powers, than as an independent colony. On the 12th of December 1687, the population of the city of Madras, Fort George, and the villages within the Company's bounds, was estimated to amount to 300,000 persons. In 1744 Madras was besieged by the French from the Mauritius under M. de la Bourdonnais, at which period the native inhabitants within the Company's territory amounted to 250,000. The English in the colony did not exceed 300, and of these 200 only were soldiers of the garrison. The town was taken on the 10th of September, and was ransomed for L.440,000, besides plunder to the amount of L.200,000 more. All the British inhabitants were afterwards compelled to abandon the place. Madras was restored at the peace of Aix-la-Chapelle, and evacuated by the French in August 1749, when it was found in a very improved condition, the bastions and batteries having been greatly enlarged and strengthened. The defences of the town were still, however, inferior to those of Fort St David, where the East India Company ordered the presidency to continue. Madras was again besieged in 1758, by the French under M. Lally. The siege commenced on the 17th of December 1758, and was prosecuted with vigour till the 17th of February, when the French were obliged precipitately to raise it. This was the last and most memorable siege which Madras ever sustained. The garrison consisted of 1758 European troops, 2200 sepoys, and 150 European inhabitants. The besieging force consisted of 3500 Europeans, 2000 sepoys, and 2000 native and European cavalry. Since this period Madras has never been assailed by an enemy, though nearly approached by Hyder's cavalry in 1781, when they descended from the mountains to ravage the plains of the Carnatic. The population of the city of Madras, Fort George, and the villages within the Company's bounds, is 300,000. Long. 80. 25. E. Lat. 13. 5. N. (Lord Valentia's *Travels;* Rennell's *Memoir;* Hamilton, &c.)

The presidency of Fort George, or of Madras, comprehends nearly the whole of India south of the Krishna River, and also that large portion of the Deccan, the Northern Circars. Within these boundaries there are three independent princes, namely, the rajahs of Mysore, Travancore, and Cochin, who, though subject to the Company in external politics, are left free to manage their own internal concerns. The rest of the country is under the immediate jurisdiction of the governor and council of Madras, and, for the collection of the revenue and the administration of justice, is divided into the following districts, namely,—

The Northern Circars.	1. Ganjam.	
	2. Vizagapatam.	
	3. Rajamundry.	
	4. Masulipatam.	
	5. Guntoor, including Palnaud, which is part of the Carnatic.	
Carnatic.	6. Nellore and Ongole, including part of the Western Pollams or Zemindaries.	
	7. Northern division of Arcot, including Sativaid, Pullicat, Coongoody in the Barramahal, part of Ballaghaut, and the Western Pollams or Zemindaries.	
	8. Chingleput, or the Jaghire.	
	9. Southern division of Arcot, including Cuddalore and Pondicherry.	
	10. Trichinopoly.	
	11. Tanjore.	
Mysore and Carnatic.	12. Dindigul, including Madura, Manapara Pollams, Ramnad, and Shevagunga, forming part of the Southern Carnatic.	
Southern Carnatic.	13. Tinevelly.	
Mysore.	14. Bellary	Balaghaut ceded districts.
	15. Cudapah	
	16. Seringapatam.	
	17. Salem and Kistnagherry.	
	18. Coimbetoor.	
	19. Canara.	
	20. Malabar.	
	21. Madras.	

A full account of these provinces, of the land revenue, the administration of justice, and other details of the same nature, is given under the article HINDUSTAN; also under the articles CANARA, MALABAR, CIRCARS NORTHERN, and the names of the districts into which the presidency is divided. (F.)

MADRID, the metropolis of the Spanish empire, and also the capital of a province of the same name, in the centre of Spain, being about 300 miles from the sea in each direction. The province includes the city, and about two hundred villages that surround it. The ground on which these several villages are built is so uneven in its surface, and has so many valleys and hills, that scarcely more than three or four of them are visible from the same point. The extent of the province is 110 square leagues, and the number of inhabitants is 228,520, including 168,000 who reside within the city.

The city of Madrid is of modern erection, and is consequently not so Gothic in appearance as the other cities of the Peninsula. Though the ground on which it stands is irregular, the streets are laid out with great judgment, well paved, and have convenient footpaths, with broad stones. The city is well supplied with water from several public fountains, and, having been filtered by passing seven or eight leagues over beds of gravel or sand, it is remarkable for its great purity. The principal square, a pile distinguished by its extent and its beauty, is in north latitude 40. 25. 7. In this square and in the other markets, notwithstanding the natural sterility of the province, an abundant supply is at all times to be seen of excellent bread, of fruits, of horticultural vegetables, of fish, of poultry, and of butcher-meat.

Madrid, though deemed a cold situation by the natives of the other towns of Spain, does in reality enjoy an equable and temperate climate. With the exception of a short period, when the dry winds from the north blow cold, and a few days in the very midst of summer, when it is intensely hot, a great degree of equality of temperature prevails. In the greatest heat the centigrade thermometer is seen at 40°, and in the cold weather it is 8° 5′. The medium heat of the year is 14° 0′ 35″ above zero. The medium height of the barometer is thirty inches and a third. Its height above the level of the sea, according to the formula of Laplace, by observations of the medium height of the barometer and thermometer at Madrid and on the coast, is 2170 English feet. It may be said, that all the circumstances which contribute to communicate salubrity to a city are found in Madrid, and hence the inhabitants enjoy as much health and longevity as are experienced by the people of any large city in Europe; nor has it ever been visited by contagious fevers.

The roads in the vicinity of Madrid are generally in a bad state; those called *caminas reales* are good, but they lead only in a few directions, and the other roads are miserably neglected. The way from the north is over some prodigious mountains, which must be passed before reaching the capital. One of the highest points of the mountains of Guadarama is 4580 feet above the level of the sea, and the extensive plains of New Castille may be seen from its summit, to the greatest extent of the powers of vision.

The whole of the city is on the left bank of the Manza-nares, a river whose waters are in general far from copious, but over which two magnificent bridges have been constructed. On its banks there are some large trees; and its waters irrigate some gardens, which are fruitful, and adjoin a royal residence, or rather retreat, called Casa de Campo. Around the city, near the river, wheat and barley are cultivated, with the assistance that the manure of a large town yields. The produce of wheat is from nine to twelve for one, and of barley from fourteen to sixteen for one, on the quantity sown. The soil is better adapted for vines, though but few are cultivated, and these rather for the table than for making wines.

There is no episcopal church in Madrid; and the other churches, though, like all in Spain, they are costly and large, do not rise so high above the common level as to attract any very particular notice. They are seventy-seven in number, and there are also seventy-five monasteries. The most magnificent pile of building in Madrid is the royal palace, built after the destruction of the former by fire in 1734. The ceilings of the palace are painted by the most eminent artists of the period, Mengs, Corrado, and Tiepolo. The richest marbles, all from Spanish quarries, are used in the floors, the cornices, and the door and window frames. The great chamber of audience is remarkably splendid, the walls are covered with beautiful marbles, hung with plate-glasses of the largest size. The ceiling, painted with allegorical history, and the cornices with figures of the different people under the Spanish crown, is admirably executed. This palace is, or rather was before the French entered it, adorned with a fine collection of pictures from the hands of the first masters. Some of the best productions of Titian, Reubens, Vandyke, Murillo, Velasquez, Spagnoletti, Mengs, and other masters, decorated this edifice. With all its magnificence, this palace is in a bad situation, and has never been the favourite residence of any of the monarchs except the original founder. Few places of equal extent have so small a number of objects to attract the notice of casual strangers as the city of Madrid. Though many of the public buildings are grand, there are none of them of such superiority as to draw great admiration from observers. The public walks are handsome and much frequented, and the gardens of the royal residence, called Buen-Retiro, are opened for the public recreations, and are highly delightful. The Puerto de Sol, and some of the other entrances, have gates that display taste in architecture, and excite admiration in travellers. There is but little commerce in Madrid, and few manufactories; the establishments by the government for making saltpetre, porcelain, brandy, cards, and tapestry, have never flourished, and are now very much reduced. As the nobility of Spain seldom reside on their domains, but attach themselves to the court, a considerable number of them are collected here, and spend their revenues: this class, with the officers of government, the members of the different boards of administration, the members of the profession of the law, the clergy, and the military, with their dependents and tradesmen, compose the great mass of the population of Madrid.

The king of Spain is an absolute monarch, and issues his orders to the different boards of administration, who put them in execution. They are, the council of Castille, the council of the Indies, the junta for the administration of justice and political affairs, the tribunal of revenues, the council of war and naval affairs, the inquisition for matters of faith, and the junta for the final decision of controversies in ecclesiastical affairs. The tribunals of justice are in Madrid; but the high tribunals in the provincial capitals decide on almost every case, without appeal being made to the court in Madrid. There are several literary institutions, which, though not of extensive influence beyond the capital, are both useful and respectable. There are four academies, one for the Spanish language, one for history, one for the arts and sciences, and one for medicine and natural history. There is a very respectable learned body, the *Sociedad Economica*, which has corresponding branches in sixty-one towns of the kingdom, established with the intention of diffusing the knowledge of political economy, and promoting the advancement of the useful arts. The royal library, always open to public inspection and use, contains upwards of 130,000 volumes of printed books, besides manuscripts, and a rich collection of medals. See the article LIBRARIES.

There is a seminary established by the government for the education of the nobility, just without the city, which is a most splendid and capacious building, and liberally, if not learnedly, supported. There are in the city no less than nineteen hospitals, and several infirmaries, to which the sick of all classes and of every country are freely admitted. The autumnal season is, of all others, that in which Madrid is, if not the most healthy, yet, on the whole, the most agreeable residence. This city was the birthplace of the poet Lopez de la Vega, in 1635; of Francisco de Quevedo Villegas, in 1647; and of Monso de Erzilla, in 1590.

MADRIGAL, a short, amorous poem, composed of a number of free and unequal verses, neither confined to the regularity of a sonnet, nor to the point or antithesis of an epigram, but only consisting of some tender and delicate thought, expressed with a beautiful, noble, or elegant simplicity. Ménage derives the word from *mandra*, which, in Latin and Greek, signifies a sheep-fold; imagining that it had been originally a kind of pastoral or shepherd's song, whence the Italians formed their *madrigale*, and the English *madrigal*. But others derive it from the word *madrugar*, which in the Spanish language signifies to rise in the morning; the *madrigales* having been formerly sung early in the morning by those who had a mind to serenade their mistresses.

MADRILEJOS, a small town of Spain, in the province of New Castille, upon a range of mountains that run between the rivers Guadiana and Tagus. It stands in a very bleak situation, and on a very sterile soil.

MADURA, an extensive district of Hindustan, in the Southern Carnatic, situated chiefly between the ninth and tenth degrees of north latitude. It was annexed in 1742 to the dominions of the nabob of the Carnatic, and in 1801 came into the possession of the British. It is bounded on the north by the Polygar territory and Dindigul, on the south by Tinevelly, on the east by the district of Marawas, and on the west by that of Dindigul. The Vaygaroo and Candaroo are the chief rivers, and the principal owns Madura and Scholavanden. It has a tolerably fertile soil, and is well supplied with water; but its cultivation has always been inferior to that of Tanjore, which was probably owing to the warlike habits of the Zemindars and Polygars, living in castles surrounded with woods, in a constant state of war with each other. The name of the capital is Madura, which is an ancient city of the Southern Carnatic, the four sides of which front nearly the four cardinal points. It was formerly well fortified with a ditch, rampart, and square towers, and from 1740 to 1760 sustained many sieges, and was often in possession of refractory Polygars. Since it has come into the possession of the British, the peace of the country has been firmly maintained, so that it is now quite superfluous to keep up this or any other fortress. The travelling distance from Seringapatam is 240 miles, and from Madras 307 miles. Long. 78. 13. E. Lat. 9. 51. N.

MADURA, an island in the Eastern Seas, situated off the north coast of the island of Java, from which it is separated by the Strait of Madura, which is a hundred miles in length by sixteen in average breadth. The channel at its narrowest part is only eighty-three fathoms wide, and is marked by buoys. There is a depth of only three fathoms at the entrance, which can easily be passed by ships of a large size, the bottom being of a soft mud, through which a vessel is carried by the slightest breeze, aided by the current, which is strong. The inhabitants resemble the Hindus in their appearance, and worship their divinities, namely, Indra, Surya, and Vishnu. The inhabitants of the interior are rude and barbarous. They attack their enemies with poisoned arrows, which they blow through a tube. The Dutch invaded and subdued this island in 1747, and made slaves of a great number of them. Long. 112. 54. E. Lat. 6. 44. to 7. 15. S.

MÆANDER, in *Ancient Geography*, a celebrated river of Asia Minor, rising near Celænæ. It flows through Caria and Ionia into the Ægean Sea between Miletus and Priene, after having been increased by the waters of the Marsyas, Lycus, Eudon, Lethæus, and other tributaries. It is celebrated amongst the poets for its windings, which amount to no less than six hundred, and from which all recurring sinuosities have received the name of *mæanders*.

MÆATÆ, anciently a people of Britain, near the wall of Severus, inhabiting the district now called *Lauderdale*, in Scotland.

MÆCENAS, Caius Cilnius, the friend and counsellor of Augustus Cæsar, a man whose name has become a synonyme for a patron of literature, from the munificent and generous support he afforded to the learned. He flourished from about 41 to 8 B. C. He was very generally considered by the ancients as descended from the royal line of Etruria. The family of the Cilnii is mentioned by Livy (x. 3) as very powerful at Arretium, now Arrezzo, B. C. 300. We have no account of the early years of Mæcenas, but there is little doubt that his education was carefully attended to, and becoming the dignity of his birth. In what way he acquired the friendship of Octavius we have no means of knowing; but we find him actively engaged in his cause immediately after the murder of Julius Cæsar, B. C. 44. His talents seem to have been particularly adapted for the administration of the civil affairs of government, and we find him more frequently thus engaged than in the active business of war. He was employed (B. C. 40) to negociate the marriage between Augustus and Scribonia, the sister of Scribonius Libo, the father-in-law of Sextus Pompey, with the view of securing a channel by which he might obtain peace with Pompey if circumstances should require it (Appian. *B. C.* v. 53). The same year Mæcenas was one of the commissioners appointed to negociate the peace between Antony and Octavius at Brundusium, which was sealed by the marriage of Octavia and Antony (v. 64). He was again the principal person employed in the conference between Octavius and Antony (B. C. 37), on the banks of the river between Metapontum and Tarentum, when peace was agreed upon (v. 92). He had the command of the whole of Italy and Rome at the time of the battle of Actium, B. C. 31, at which period he put down a conspiracy entered into by Lepidus the son of the triumvir (iv. 50; Vell. Pat. ii. 88). The victory at Actium having placed the Roman empire in the hands of Octavius, he consulted with his friends, Agrippa and Mæcenas, whether he ought not to abdicate his authority. Agrippa advised him to restore the republic, but Mæcenas was of a contrary opinion. The speeches which they each delivered are given by Dion Cassius (411, 1–40). Augustus adopted the opinion of Mæcenas, and was guided in all his more important transactions by his advice, having confidence not only in his good sense and discretion, but in the integrity of his character. To Mæcenas therefore may, in a great measure, be ascribed the glory of his reign. After his death, Augustus frequently regretted that he had no longer a friend to assist him; and when he had committed any act of which he repented, he used to say, that if Mæcenas or Agrippa had been alive, he would not have had cause to reproach himself for the folly of his conduct (Sen. *De Benef.* vi. 32). It is said that Mæcenas one day observed Augustus on the point of condemning some persons to death, and being unable to approach the tribunal on account of the crowd, he threw a paper to him, on which he had inscribed these words, "Descend from the tribunal, thou butcher;" upon which Augustus, struck by the admonition, left the judgment-seat without passing sentence. The palace of Mæcenas was on the Esquiline Hill, and his gardens are frequently mentioned as occupying the ground which had been previously employed as the place of burial for the poor (Tacit. *Ann.* xv. 39). It is, however, to his generous patronage of the learned that he is principally indebted for his fame; and their gratitude has amply repaid all the attention he may have bestowed on them. His palace was the common resort of all the literary characters of his age. There might be found Virgil and Horace, Varius, famed for his tragedies, Propertius, Domitius Marsus the rival of Catullus, Valgius, Plotius, and Tucca. It was through Mæcenas that the learned had access to the emperor, and were loaded with his favours. Horace gives a very interesting account of his introduction to Mæcenas, which must have taken place as early as B. C. 40, when both the poet and Mæcenas were still young. To Mæcenas Horace was indebted for his Sabine farm; and Virgil was through him restored to his paternal estate, near Mantua. Virgil dedicated the Georgics to his patron; and to him Propertius has dedicated several of his poems. It is needless to add, that much of the poetry of Horace was also addressed to him. Mæcenas has been accused, however, of being devoted to pleasure; but his faults were those of the age in which he lived, and his virtues were his own (Senec. *Epist.* 92, 114). Virgil died many years before Mæcenas, B. C. 19; but whether Horace predeceased Mæcenas or not is uncertain. Horace died in the month of November B. C. 8 (Sueton.); and Dion Cassius (41, 3) mentions the death of Mæcenas towards the close of the same year. The clause in the will of Mæcenas, in which he recommends to Augustus his friend Horace, would lead us to conclude that Horace survived him. At all events, only a few months could have intervened between their deaths. He was married to Terentia, a woman of a disagreeable temper, from whom he frequently separated; but found his happiness so dependent on her smiles, that he soon received her back to his arms (Sen. *De Prov.* 3). Pliny states that the health of Mæcenas was at all times delicate; and that for the last three years of his life he scarcely enjoyed an hour's sleep (vii. 52, 2). Of the writings of Mæcenas we have nothing remaining except a few epigrams, which are published in the *Anthologia Latina* of Burmann (i. 53, ii. 225, iii. 149). He was also the author of two tragedies, Prometheus and Octavia; and is supposed to have written Memoirs to serve for the history of Augustus. (See Fabricius, *Bibliotheca Latina*, iii. 964; *De Mæcenatis Vitâ, Moribus, et Rebus Gestis*, auct. Meibom. Lugd. Bat. 1653; Lion, *Mæcenatiana*, Götting. 1824; *Mémoires de l'Acad. des Inscrip.* xiii.)

MAELSTROM, a dangerous whirlpool on the coast of Norway, in the sixty-eighth degree of latitude, in the province of Nordland and the district of Lofoden, and near the island of Moskoe, whence it also takes the name of *Moskoe-ström*. Its violence and noise exceed that of a cataract, being heard at a great distance, and without any intermission, except a quarter every sixth hour, that is, at the turn of high and low water, when its impetuosity seems checked; and this short interval is the only time during which the fishermen can venture in: but the motion soon returns, and, however calm the sea may be, gradually in-

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creases, with such a draught and vortex, as to absorb whatever comes within its sphere of action, and keep it under water for some hours, when the fragments, shivered by the rocks, again appear.

MÆMACTERIA, sacrifices offered to Jupiter at Athens in the winter month Mæmacterion, when the god surnamed Mæmactes was entreated to send mild and temperate weather, as he presided over the seasons, and was the god of the air.

MÆMACTERION was the fourth month of the Athenian year, containing twenty-nine days, and answering to the latter part of our September and the beginning of October. It received its name from the festival *Mæmacteria*, which was observed about this time. This month was called by the Bœotians *Alalcomenius.*

MÆONIA, a country of Asia Minor, and forming part of Lydia, being in the neighbourhood of Mount Tmolus, and the country watered by the Pactolus. The rest on the sea-coast was called Lydia.

MÆONIDÆ, a name given to the muses, because Homer, their greatest and worthiest favourite, was supposed to be a native of Mæonia.

MÆONIDES, a surname of Homer, because, according to the opinion of some writers, he was born in Mæonia, or because his father's name was Mæon.

MÆOTIS PALUS or LACUS, *Mæotica Palus*, or *Mæoticus Lacus*, in *Ancient Geography*, a large lake, or part of the sea, between Europe and Asia, at the northern extremity of the Euxine, with which it communicates by the Cimmerian Bosphorus. It was worshipped as a deity by the Massagetæ. It extends about 390 miles from south-west to north-east, and is about 600 miles in circumference. The *Palus Mæotis*, or Sea of Azof, reaches from the Crimea to the mouth of the Don.

MAESNIEL, a town of the Netherlands, in the province of Limburg, and arrondissement of Roermonde. It contains 200 houses and 1180 inhabitants.

MÆSTLIN, MICHAEL, in Latin *Mæstlinus*, a celebrated astronomer of Germany, was born in the duchy of Wittemberg, but spent his youth in Italy. He made a speech in favour of Copernicus's system, which is supposed to have brought over Galileo from Aristotle and Ptolemy, to whom he had been hitherto entirely devoted. He afterwards returned to Germany, and became professor of mathematics at Tubingen, where, amongst his scholars, he taught Kepler, who has praised several of his ingenious inventions in his *Astronomia Optica.* Though Tycho Brahe did not assent to Mæstlin's opinion, yet he allowed him to be an extraordinary person, and deeply skilled in the science of astronomy. Mæstlin published many mathematical and astronomical works, and died in 1590.

MAESTRICHT, a city of the Netherlands, in the province of Limburg, of which it is the capital, as well as of the arrondissement of the same name. It is situated on the left side of the river Meuse, over which is a stone bridge 500 feet in length, connecting it with the suburb Wyk. It is one of the strongest as well as one of the most extensive fortifications in Europe, including in it the citadel of Petersburg. It is well built, has a fine place or square, eight churches, three hospitals, and an orphan-house. It contains 3000 houses, and 19,500 inhabitants. The chief commerce is that which arises from the river, by which the stone is conveyed to Holland, as well as the coal and iron from Liège. There are some breweries and distilleries, and some small manufactures of common articles. Long. 5. 35. 41. E. Lat. 50. 51. 7. N.

MAFFÆUS, VEGIO, a Latin poet, born in Lombardy in 1407, was greatly admired in his time. He wrote epigrams, and a humorous supplement to Virgil, which he called the thirteenth book of the Æneid, and which has been translated into English by Mr Ellis. Maffæus also wrote some prose works. He was chancellor of Rome towards the end of the pontificate of Martin V., and died in 1458.

MAFFEI, SCIPIO, a celebrated Italian poet, descended of an ancient and illustrious family at Verona, was born in 1675. After having finished his studies, he took arms, and distinguished himself by his valour at the battle of Donawert; but he more particularly signalized himself by his love of learning, which made him undertake several journeys into France, England, and Germany. He conversed with the learned in all these countries, and obtained their friendship and esteem. He was a member of the academy of the Arcadians at Rome, an honorary foreign member of that of Inscriptions at Paris, and died in 1755. He wrote many works in verse and prose, which are esteemed. Of these, the best known are, 1. The Tragedy of Merope, of which there are two French translations in prose; 2. Ceremony, a comedy; 3. A Translation, into Italian verse, of the first book of Homer's Iliad; 4. Many other pieces of poetry, in a collection entitled *Rhyme and Prose*, 4to. His principal works in prose are, 1. Verona Illustrata; 2. Istoria Diplomatica; 3. Scienza Cavalleresca, an excellent work, in which he attacks duelling; 4. An edition of the Theatro Italiano; 5. An edition of Cassiodorus on the Epistles, Acts of the Apostles, and Apocalypse; and, 6. Galliæ Antiquitates quædam selectæ, atque in plures Epistolas distributæ; besides several other works.

MAFRA, a small town in Portugal, the principal celebrity of which is derived from a royal convent, one of the most splendid in the kingdom. The convent contains three hundred cells, for as many monks. The church, which is in the centre, is large and handsome; and the marble steps leading to it are peculiarly grand. The interior is ornamented with beautiful marbles, exquisitely wrought. There are in it six organs and twelve altars. The whole pile is enormous, being two hundred and sixty feet in length, containing eight hundred and seventy apartments, and five thousand two hundred windows. Near the convent is an extensive and beautiful royal park, well stocked with game of every kind. It is in the province of Estremadura, and contains 1000 inhabitants.

MAGADA, in *Mythology*, a title under which Venus was known and worshipped in Lower Saxony, where this goddess had a famous temple, which was treated with respect even by the Huns and Vandals when they ravaged the country. It is said to have been destroyed by Charlemagne.

MAGAS, MAGADIS (from μαγαδιζειν, *to sing or play in unison*), the name of a musical instrument in use amongst the ancients. There were two kinds of *magades*, the one a stringed instrument, formed of twenty chords arranged in pairs, and tuned to unison, so that they yielded ten sounds; the invention of which is ascribed by some to Sappho, by others to the Lydians, and by others to Timotheus of Miletus. The other was a kind of flute, which at the same time yielded very high and very low notes. The former kind was much improved by Timotheus of Miletus, who is said to have been impeached of a crime, because, by increasing the number of chords, he spoiled and discredited the ancient music.

MAGAZINE, a place in which stores are kept, of arms, ammunition, provisions, and the like.

Powder MAGAZINE is that place where gunpowder is kept in large quantities. The first powder magazines were made with Gothic arches; but Vauban finding them too weak, constructed them in a semicircular form. Their usual dimensions are sixty feet long within, and twenty-five broad; the foundations are eight or nine feet thick, and eight feet high from the foundation to the spring of the arch; and the floor is two feet from the ground, which secures it from dampness.

Artillery MAGAZINE. In a siege, the magazine is made about twenty-five or thirty yards behind the battery, towards the parallels, and at least three feet under ground, to contain the powder, loaded shells, portfires, and the like.

MAGAZINE, on shipboard, a close room or storehouse, built in the fore or after part of the hold, to contain the gunpowder used in battle. This apartment is strongly secured against fire, and no person is allowed to enter it with a lamp or candle; it is therefore lighted, as occasion requires, by means of the candles or lamps in the *light-room* contiguous to it.

MAGAZINE, Literary, a well-known species of periodical publications. One of the first that appeared was *The Gentleman's Magazine*, set on foot by Mr Edward Cave, in the year 1731. This, as Dr Kippis observes,[1] "may be considered as something of an epocha in the literary history of this country. The periodical performances before that time were almost wholly confined to political transactions, and to foreign and domestic occurrences; but the monthly magazines have opened a way for every kind of inquiry and information. The intelligence and discussion contained in them are very extensive and various; and they have been the means of diffusing a general habit of reading through the nation, which, in a certain degree, hath enlarged the public understanding. Many young authors, who have afterwards risen to considerable eminence in the literary world, have here made their first attempts in composition. Here too are preserved a multitude of curious and useful hints, observations, and facts, which otherwise might have never appeared; or, if they had appeared in a more evanescent form, would have incurred the danger of being lost."

MAGDALEN, MARY. See MARY.

Religious of St MAGDALEN, a denomination given to different communities of nuns, consisting generally of penitent courtezans, sometimes also called *Magdalenettes*. Such were those at Metz, established in 1452; those at Paris, in 1492; those at Naples, first established in 1324, and endowed by Queen Sancha, to serve as a retreat for public courtezans, who should betake themselves to repentance; and those of Rouen and Bordeaux, which had their origin amongst those of Paris in 1618. In each of these monasteries there are three kinds of persons and congregations; the first consists of those who are admitted to make vows, and these bear the name of *St Magdalen;* the second is the congregation of St Martha, composed of those whom it is not judged proper to admit to vows; and the third is the congregation of St Lazarus, composed of such as are detained there by force. The religious of St Magdalen at Rome were established by Pope Leo X. Clement VIII. settled a revenue on them, and further appointed that the effects of all public prostitutes dying intestate should fall to them, and that the testaments of the rest should be invalid unless they bequeathed to them a portion of their effects, amounting at least to a fifth part.

MAGDALENA, one of the Marquesas Islands, about five leagues in circumference, and supposed to be in south latitude 10. 25. and west longitude 138. 50. It was only seen at nine leagues distance by those who discovered it.

MAGDEBURG, a government of the Prussian province of Saxony, formed out of the ancient duchy of that name, of the county of Barby, and of all the bailiwick of Gommern except the circle of the Saal; but the principalities of Halberstadt, of Derenburg, of Quedlingburg, of Wernigerode, and of Schauen, are included within it. It extends over 4489 square miles, and comprehends fifty cities or towns once walled, three market-towns, and 1497 villages and hamlets, containing a population (in 1826) of 526,197 persons. It is divided into fifteen circles, one of which, of the same name, contains the capital of the government. The city of Magdeburg is situated on a rising ground, on the left bank of the river Elbe. It is very strongly fortified on the south side by strong lines, with ditches and sixteen bastions, and by two forts; on the north, the river is a defence, as well as the marshes beyond it, and several powerful outworks. There is a bridge leading to the citadel, which is built on an island formed by one of the branches of the Elbe. The walls are of great thickness, and though the ditches on the land side are dry, they are all undermined. The city is built in the old Saxon style, with large massive houses, and, with the exception of the high street, narrow lanes. There are, however, two good open places, the old market and the cathedral place. Some of the public buildings are magnificent, particularly the government-house and the Domkish, the latter of which has a tower 330 feet high, which has survived the destruction that visited the city when it was stormed, plundered, and burned by the imperial army under Tilly, in the Thirty Years' War. It contains now sixteen churches, ten of which are Lutheran, the others Catholic, Calvinist, or Menonite. It is a place of great commercial as well as manufacturing industry. Its situation on the Elbe connects it with the sea, through Hamburg and the upper parts of the river, including Prussia. Saxony, and a part of Bohemia, receive their foreign productions by this channel. The goods made in Magdeburg are of linen, cotton, and woollen, hats, hosiery, corn, spirits, leather, soap, and tobacco and snuff. The fields around it are fertile, and the government is the corn granary of Prussia; and large quantities of tobacco are grown. The city and suburbs contain 52,000 inhabitants, exclusive of military. Long. 11. 33. 25. E. Lat. 52. 8. 4. N.

MAGEBOE, a large island in the northern part of Norwegian Lapland. It is a rocky spot, with a few valleys, in which pasture is found sufficient to maintain a few families, who have some cows, and a small number of sheep, and about 600 rein-deer. The winter is dreadfully severe, and the ground is covered with snow to the depth of twelve or fourteen feet. It is in long. 26. 45. E. and lat. 71. 30. N.

MAGELLAN, or MAGELHAENS, FERDINAND DE, an eminent navigator, was by birth a Portuguese, and of a good family. He served with reputation in the East Indies for five years under Albuquerque, and in 1510 he greatly distinguished himself at the battle of Malacca. Deeming his services poorly repaid by his own court, he entered into the employment of Charles V. king of Spain. He has been charged with peculation by some of his countrymen, who assign this as the reason why he quitted Portugal. In conjunction with Ruy Folero he formed the bold design of discovering a new passage by the west to the Molucca Islands, which, he offered to prove, fell within the division of the globe assigned by the pope to the crown of Castille. It is said that he first proposed this enterprise to Emanuel king of Portugal, who rejected it, as opening a way for other nations to have access to the East Indies, the trade of which was then monopolized by the Portuguese. The proposition was agreed to by the king of Spain, and, on the 20th of September 1519, Magellan sailed from San Lucar, with five ships and 236 men under his command. His officers soon murmured at this appointment, considering it as a disgrace to be commanded by a renegade Portuguese; and when the fleet was lying at a port in South America, which they named San Julian, a conspiracy was formed against him by three of the captains, but he discovered and quelled it. He caused the captain of one of the ships to be put to death, he boarded a second and secured the mutineers, and the third submitted.

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[1] *Biographia Britannica*, vol. iii. art. *Cave*.

The coast on which they lay was that of Patagonia; and this first voyage contains accounts of the extraordinary stature of the natives. About the end of October they reached a cape to which they gave the name of De las Virgines, forming the entrance of the straits which now bear the name of Magellan. He exerted all his authority to induce his men to venture on this unknown passage, with the view of crossing a vast ocean beyond it, at the hazard of running short of provisions, of which a supply for three months was all that he had remaining. One of his ships abandoned him, and made the best of her way to Europe. But the rest proceeded, and on the 27th of November they discovered the South Sea, which made Magellan shed tears of joy. They continued their voyage across this ocean, now visited for the first time by Europeans, and were not long in suffering those evils from famine which they had apprehended. The men were reduced to the necessity of eating the hides with which the rigging was covered. The weather proved so uniformly calm and temperate, that they gave to the ocean the name of *Pacific.* On the 6th of March they came in sight of the Ladrones, so called from the thievish disposition of the inhabitants; and thence they sailed to the Philippines. At Zebu, Magellan obtained with little difficulty the conversion of the king; and, on condition of his becoming a vassal of Spain, the Portuguese assisted him in reducing some neighbouring chieftains, and the cross was erected over some burned villages.

With about fifty men Magellan landed upon Matan, the chief of which had refused to submit to Zebu, and an engagement took place between them, which lasted for the greater part of the day. His troops having spent all their ammunition, found it necessary to retreat, during which Magellan was wounded in the leg by an arrow, beaten down, and at last slain with a lance. This happened in 1521. By this act of imprudence he lost the honour of being the first circumnavigator of the globe, which fell to the lot of Cano, who brought his ship home by the East Indies. Yet Magellan has secured an immortal name amongst maritime discoverers, by the commencement of this great enterprise, in which he displayed extraordinary skill and resolution, but disregarded justice and humanity.

Straits of MAGELLAN, a narrow passage between the island of Tierra del Fuego and the southern extremity of the continent of America. This passage was first discovered by Ferdinand Magellan, who sailed through it into the South Sea, and thence to the East Indies. Other navigators have passed the same way; but as these straits are exceedingly difficult, and subject to storms, it has been common to sail round by Cape Horn, rather than through the Straits of Magellan.

MAGELLANIC CLOUDS, whitish appearances like clouds, seen in the heavens towards the south pole, and having the same apparent motion as the stars. They are three in number, two of them near each other. The largest lies far from the south pole; but the other two are not many degrees more remote from it than the nearest conspicuous star, that is, about eleven degrees.

MAGENTA, a city of Italy, in the delegation of Milan, in the Austrian kingdom of Venetian Lombardy, containing 3390 inhabitants.

MAGGI, JEROME, in Latin *Magius*, one of the most learned men of the sixteenth century, was born at Anghiari in Tuscany. He applied himself to all the sciences, and even to the art of war; and distinguished himself so much in this last study, that the Venetians sent him into the island of Cyprus in quality of judge of the admiralty. When the Turks besieged Famagusta, he performed all the services that could be expected from the most excellent engineer, inventing mines and machines for throwing fire, by means of which he destroyed all the works of the besiegers, and in an instant overthrew what had cost the Turks infinite labour. But the Ottomans had their revenge; for, having taken the city in 1571, they plundered his library, carried him loaded with chains to Constantinople, and treated him in the most inhuman and barbarous manner; nevertheless he comforted himself by the example of Æsop, Menippus, Epictetus, and other learned men; and, after passing the whole day in the meanest drudgery, he spent the night in writing. By the help of his memory alone, he composed treatises filled with quotations, which he dedicated to the imperial and French ambassadors. These ministers, moved by compassion for this learned man, resolved to purchase him; but whilst they were treating for his ransom, Maggi found means to make his escape, and to get to the imperial ambassador's house; when the grand visir, being enraged at his flight, and remembering the great mischief he had done to the Turks during the siege of Famagusta, sent to have him seized, and caused him to be strangled in prison in 1572. His principal works are, 1. A Treatise on the Bells of the Ancients; 2. On the Destruction of the World by Fire; 3. Commentaries on Æmilius Probus's Lives of Illustrious Men; 4. Commentaries on the Institutes. These works are written in elegant Latin. He also wrote a treatise on fortification, in Italian; and a book on the situation of ancient Tuscany. He ought not to be confounded with his brother Bartolomeo Maggi, a physician at Bologna, who wrote a treatise on gunshot wounds; nor with Vincent Maggi, a native of Bresse, and a celebrated professor of humanity at Ferrara in Padua, who was the author of several works.

MAGGIORE, LAGO, a beautiful lake, situated on the confines of Switzerland and Italy, on the south side of the Alps. It is about fifty miles long, and four or five miles broad, and is bent into a very irregular figure.

MAGGOT, the common name of the fly-worm bred in flesh, from the egg of the great blue flesh-fly.

MAGI, or MAGICIANS, an ancient religious sect in Persia, and other countries, who maintained that there were two principles, one the cause of all good, the other the cause of all evil; and, abominating the adoration of images, they worshipped God only by fire, which they looked upon as the brightest and most glorious symbol of Oromasdes or the good god, as darkness is the truest symbol of Ahriman or the evil god. This religion was reformed by Zoroaster, who maintained that there was one supreme independent Being, and under him two principles or angels, one the angel of goodness and light, and the other the angel of evil and darkness; that there is a perpetual struggle between them, which shall last to the end of the world; that then the angel of darkness and his disciples shall go into a world of their own, where they shall be punished in everlasting night; and that the angel of light and his disciples shall also go into a world of their own, where they shall be rewarded in everlasting day. The priests of the Magi were the most skilful mathematicians and philosophers of the ages in which they lived, insomuch that a learned man and a magician became equivalent terms. The vulgar looked on their knowledge as supernatural; and hence those who practised wicked and mischievous arts, taking upon themselves the name of *magicians*, drew on it that ill signification which the word now bears amongst civilised nations.

MAGIC (*Magice*, Μαγεια), in its ancient sense, the science or discipline and doctrine of the Magi, or wise men of Persia.

The origin of magic and the magi is ascribed to Zoroaster. Salmasius derives the very name from Zoroaster, who, he says, was surnamed *Mag*, whence Magus. But others, instead of making him the author of the Persian philosophy, represent him only as the restorer and improver thereof, alleging, that many of the Persian rites in use amongst the Magi were borrowed from the Zabii or Chaldæans, who agreed in many things with the Magi of the Persians; and hence some make the name *Magus* common both to the Chaldæans and Persians. Thus Plutarch mentions, that Zoroaster instituted Magi amongst the Chaldæans, in imitation of which the Persians had also theirs.

Magic, in a more modern sense, is a science which teaches to perform wonderful and surprising feats, or to produce unexpected effects.

The word *magic* originally carried with it a very innocent, nay, laudable meaning, being used purely to signify the study of wisdom, and the more sublime parts of knowledge; but as the ancient Magi engaged themselves in astrology, divination, sorcery, and the like, the term *magic* became in time odious, and was only used to signify an unlawful and diabolical kind of science, depending on the assistance of the devil and departed souls.

If any wonder how so vain and deceitful a science should ever have gained credit and authority over men's minds, Pliny solves the mystery. It is, says he, because it has possessed itself of three sciences in the most esteem amongst men, taking from each all that is great and marvellous in it. Nobody doubts but it had its origin in medicine; and that it insinuated itself into the minds of the people, under pretence of affording extraordinary remedies. To these fine promises it added every thing in religion that is pompous and splendid, and that appears calculated to blind and captivate mankind. Lastly, it mingled with the rest judicial astrology, persuading people, curious of futurity, that it saw every thing to come in the heavens. Agrippa divides magic into three kinds; natural, celestial, and ceremonial or superstitious.

Natural Magic is no more than the application of natural active causes to passive subjects, by means of which many surprising, but yet natural, effects are produced.

In this way many of our experiments in natural philosophy, especially those of electricity, optics, and magnetism, have a kind of magical appearance, and amongst the ignorant and credulous might easily pass for miracles. Such, without doubt, have been some of those miracles wrought by ancient magicians, whose knowledge of the various powers of nature, there is reason to believe, was much greater than modern vanity will sometimes allow.

Baptista Porta wrote a treatise of natural magic, or secrets for performing extraordinary things by natural causes. The natural magic of the Chaldæans was nothing but the knowledge of the powers of simples and minerals. The magic which they called *theurgia* consisted wholly in the knowledge of the ceremonies to be observed in the worship of the gods, in order to be acceptable. By virtue of these ceremonies they believed they could converse with spiritual beings, and cure diseases.

Celestial Magic borders nearly on judicial astrology. It attributes to spirits a kind of rule or dominion over the planets, and to planets a dominion over men; and on these principles builds a ridiculous kind of system.

Superstitious Magic consists in the invocation of devils. Its effects are usually evil and wicked, though very strange, and seemingly surpassing the powers of nature, being supposed to be produced by virtue of some compact, either tacit or express, with evil spirits; but the truth is, these have not all the power which is usually imagined, nor do they produce those effects which are ordinarily ascribed to them.

This species of magic, there is every reason to believe, had its origin in Egypt, the native country of paganism. The first magicians mentioned in history were Egyptians; and that people, so famed for early wisdom, believed not only in the existence of demons, the great agents in magic, but also that different orders of those spirits presided over the elements of earth, air, fire, and water, as well as over the persons and affairs of men. Hence they ascribed every disease with which they were afflicted to the immediate agency of some evil demon. When a person was seized with a fever, for instance, they did not think it necessary to search for any natural cause of the disease; it was immediately attributed to some demon which had taken possession of the body of the patient, and which could not be ejected but by charms and incantations.

These superstitious notions having spread from Egypt over all the East, the Jews imbibed them during their captivity in Babylon. Hence we find them in the writings of the New Testament attributing almost every disease to which they were incident to the immediate agency of devils. Many of the same impious superstitions were brought from Egypt and Chaldæa by Pythagoras, and transmitted by him and his followers to the Platonists in Greece. This is apparent from the writers of the life of Pythagoras. Jamblicus, speaking of the followers of that philosopher, says expressly that they cured certain diseases by incantations; and Porphyry adds, that they cured diseases both of the mind and of the body by songs and incantations. This was exactly the practice of the Egyptian priests, who were all supposed to keep up a constant intercourse with demons, and to have the power of controlling them by magical charms and sacred songs. Agreeably to this practice of his masters, we are told that Pythagoras directed that certain diseases of the mind, doubtless those which he attributed to the agency of demons, should be cured partly by *incantations*, partly by *magical hymns*, and partly by *music*.

It was the universal belief of the ancient nations, says the learned Mosheim, and especially of the orientals, that certain sounds and words, for the most part barbarous, were highly grateful, and that others were equally disagreeable, to these spirits. Hence, when they wished to render a demon propitious, and to employ him on any particular office, the magicians composed their sacred songs of the words which were believed to be agreeable to him; and when it was their intention to drive him from themselves or others, they sung in a strain which they fancied a demon could not hear but with horror. From the same persuasion arose the custom of suspending from the neck of a sick person, whose disease was supposed to be inflicted by a demon, an amulet, sometimes made of gold and sometimes of parchment, on which was written one or more of those words which demons could not bear either to hear or to see; and in a didactic poem on the healing art, still extant, we are taught by Serenus Sammonicus, that the word *Abracadabra* is an infallible remedy for a semitertian fever or ague; and to banish grief of heart, Marcellinus thinks nothing more effectual than the word *καριαγαων*. In more modern times, as we are informed by Agrippa, the words employed by those in compact with the devil, to invoke him, and to succeed in what they undertake, are, *Dies*, *mies*, *jesquet*, *benedoefet*, *douvima*, *enitemaus*. There are a hundred other formulas of words composed at pleasure, or gathered from several different languages, or patched from the Hebrew, or formed in imitation of that language. And amongst the primitive Christians there was a superstitious custom, of which we suspect some remains may yet be found amongst the illiterate vulgar in different countries, of fastening to the neck of a sick person, or to the bed upon which he lay, some text from the New Testament, and especially the first two or three verses of the Gospel of St John, as a charm undoubtedly efficacious to banish the disease.

The revival of learning, and the success with which the laws of nature have been investigated, have long ago banished this species of superstition from all the enlightened nations of Europe.

Magic Square.

Magic Square, a square figure, formed of a series of numbers in mathematical proportion, so disposed in parallel and equal ranks, that the sums of each row, taken either perpendicularly, horizontally, or diagonally, are equal.

Let the several numbers which compose any square number (for instance, 1, 2, 3, 4, 5, &c. to 25, the square number, inclusive) be disposed in their natural order after each other in a square figure of twenty-five cells, each in its cell; if now you change the order of these numbers, and dispose them in the cells in such manner that the five numbers which fill a horizontal rank of cells, being added together, shall make the same sum with the five numbers in any other rank of cells, whether horizontal or vertical, and even the same number with the five in each of the two diagonal ranks; this disposition of numbers is called a *magic square*, in opposition to the former disposition, which is called a *natural square*. See the figures following.

Natural Square.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

Magic Square.

16	14	8	2	25
3	22	20	11	9
15	6	4	23	17
24	18	12	10	1
7	5	21	19	13

One would imagine that these magic squares had that name given them because this property of all their ranks, which, taken any way, make always the same sum, appeared extremely surprising, especially in certain ignorant ages, when mathematics passed for magic; but there is a great deal of reason to suspect that these squares merited their name still further, by the superstitious operations they were employed in, as the construction of talismans, and the like; for, according to the childish philosophy of those days, which attributed virtues to numbers, what virtue might not be expected from numbers which appeared so wonderful?

However, what was at first the vain practice of makers of talismans and conjurers, has since become the subject of serious research amongst mathematicians; not that they imagine it will lead them to any thing of solid use or advantage (magic squares savour too much of their original to be of any great use), but only as it is a kind of play, where the difficulty makes the merit, and it may chance to produce some new views of numbers, which mathematicians will not lose the occasion of discovering.

Moschopulus, a Greek author of no great antiquity, is the first who appears to have spoken of magic squares; and, by the age in which he lived, there is reason to imagine he did not look on them merely as a mathematician. However, he has left us some rules for their construction. In the treatise of Cornelius Agrippa, so much accused of magic, we find the squares of seven numbers, viz. from three to nine inclusive, disposed magically; and it must not be supposed that these seven numbers were preferred to all the others without some very good reason. In effect, it is because their squares, according to the system of Agrippa and his followers, are planetary. The square of 3, for instance, belongs to Saturn; that of 4 to Jupiter; that of 5 to Mars; that of 6 to the Sun; that of 7 to Venus; that of 8 to Mercury; and that of 9 to the Moon. Bachet applied himself to the study of magic squares, on the hint which he had taken from the planetary squares of Agrippa, as being unacquainted with the work of Moschopulus, which is only in manuscript in the French king's library; and, without the assistance of any author, he found out a new method for those squares whose root is uneven, for instance twenty-five, forty-nine, &c. but he could not make any thing of those whose root is even.

After him came Frenicle, who took the same subject in hand. A certain great algebraist was of opinion, that whereas the sixteen numbers which compose the square might be disposed 20922789888000 different ways in a natural square (as from the rules of combination it is certain they may), they could not be disposed in a magic square above sixteen different ways; but Frenicle showed that they might be thus disposed 878 different ways; and hence it appears how much his method exceeds the former, which only yielded the fifty-fifth part of magic squares of that of Frenicle.

To this inquiry he thought fit to add a difficulty that had not yet been considered. The magic square of 7, for instance, being constructed, and its forty-nine cells filled, if the two horizontal ranks of cells, and, at the same time, the two vertical ones, the most remote from the middle, be retrenched, that is, if the whole border or circumference of the square be taken away, there will remain a square whose root will be 5, and which will only consist of twenty-five cells. Now it is not at all surprising that the square should be no longer magical, because the ranks of the large ones were not intended to make the same sum, excepting when taken entire with all the seven numbers that fill their seven cells; so that being mutilated each of two cells, and having lost two of their numbers, it may be well expected that their remainders will not any longer make the same sum. But Frenicle would not be satisfied, unless, when the circumference or border of the magic square was taken away, and even any circumferences at pleasure, or, in fine, several circumferences at once, the remaining square was still magical; which last condition, no doubt, made these squares vastly more magical than ever.

Again, he inverted that condition, and required that any circumference taken at pleasure, or even several circumferences, should be inseparable from the square; that is, that it should cease to be magical when they were removed, and yet continue magical after the removal of any of the rest. Frenicle, however, gives no general demonstration of his methods, and frequently seems to have no other guide but chance. It is true, his book was not published by himself, nor did it appear till after his death, viz. in 1693.

In 1703, Poignard, a canon of Brussels, published a treatise of sublime magic squares. Before him there had been no magic squares constructed but for series of natural numbers that formed a square; but Poignard made two very considerable improvements. Instead of taking all the numbers that fill a square, for instance, the thirty-six successive numbers, which would fill all the cells of a natural square whose side is 6, he only takes as many successive numbers as there are units in the side of the square, which, in this case, are six; and these six numbers alone he disposes in such manner in the thirty-six cells, that none of them are repeated twice in the same rank, whether it be horizontal, vertical, or diagonal; whence it follows, that all the ranks, taken all the ways possible, must always make the same sum, which Poignard calls repeated progression. Instead of being confined to take these numbers according to the series and succession of the natural numbers, that is, in an arithmetical progression, he takes them likewise in a geometrical progression, and even in an harmonical progression. But with these two last progressions the magic must necessarily be different from what it was. In the squares filled with numbers in geometrical progression, it consists in this, that the products of all the ranks are equal; and in the harmonical progression, the numbers of all the ranks continually follow that progression. He makes squares of each of these three progressions repeated.

The book of Poignard gave occasion to M. de la Hire to turn his thoughts the same way, which he did with such success that he seems to have well nigh completed the theory of magic squares. He first considers uneven squares, all his predecessors on the subject having found the construction of even ones by much the most difficult, for which reason M. de la Hire reserves these for the last. This excess of difficulty may arise partly from this, that the numbers are taken in arithmetical progression. Now in that progression, if the number of terms be uneven, that in the middle has some properties which may be of service; for instance, being multiplied by the number of terms in the progression, the product is equal to the sum of all the terms.

M. de la Hire proposes a general method for uneven squares, which has some similitude to the theory of compound motions, so useful and fertile in mechanics. As that consists in decomposing motions, and resolving them into others more simple; so does M. de la Hire's method consist in resolving the square that is to be constructed, into two simple and primitive squares. It must be owned, however, it is not quite so easy to conceive these two simple and primitive squares in the compound or perfect square, as in an oblique motion to imagine a parallel and perpendicular one.

Suppose a square of cells, whose root is uneven, for instance 7; and that its forty-nine cells are to be filled magically with numbers, for instance the first 7; M. de la Hire, on the one side, takes the first seven numbers, beginning with unity, and ending with the root 7, and on the other, 7, and all its multiples to forty-nine exclusively; and as these only make six numbers, he adds 0, which makes this an arithmetical progression of seven terms as well as the other, viz. 0, 7, 14, 21, 28, 35, 42. This done, with the first progression repeated, he fills the square of the root magically. In order to this, he writes in the first seven cells of the first horizontal rank the seven numbers proposed, in what order he pleases, for that is absolutely indifferent; and it is proper to observe here, that these seven numbers may be ranged in 5040 different manners in the same rank. The order in which they are placed in the first horizontal rank, be it what it will, is that which determines their order in all the rest. For the second horizontal rank, he places in its first cell, either the third, the fourth, the fifth, or the sixth number, from the first number of the first rank; and after that he writes the six others in order as they follow. For the third horizontal rank, he observes the same method with regard to the second that he observed in the second with regard to the first, and so of the rest. For instance, suppose the first horizontal rank filled with the seven numbers in their natural order, 1, 2, 3, 4, 5, 6, 7, the second horizontal rank may either commence with 3, with 4, with 5, or with 6; but in this instance it commences with 3; the third rank therefore must commence with 5, the fourth with 7, the fifth with 2, the sixth with 4, and the seventh with 6. The commencement of the ranks which follow the first being thus determined, the other numbers, as we have already observed, must be written down in the order in which they stand in the first, going on to 5, 6, and 7, and returning to 1, 2, &c. till every number in the first rank be found in every rank underneath, according to the order arbitrarily pitched upon at first. By this means it is evident that no number whatever can be repeated twice in the same rank; and by consequence, that the seven numbers 1, 2, 3, 4, 5, 6, 7, being in each rank, must of necessity make the same sum.

1	2	3	4	5	6	7
3	4	5	6	7	1	2
5	6	7	1	2	3	4
7	1	2	3	4	5	6
2	3	4	5	6	7	1
4	5	6	7	1	2	3
6	7	1	2	3	4	5

It appears from this example that the arrangement of the numbers in the first rank being chosen at pleasure, the other ranks may be continued in four different manners; and since the first rank may have 5040 different arrangements, there are no less than 20,160 different modes of constructing the magic square of seven numbers repeated.

1	2	3	4	5	6	7
2	3	4	5	6	7	1
3	4	5	6	7	1	2
4	5	6	7	1	2	3
5	6	7	1	2	3	4
6	7	1	2	3	4	5
7	1	2	3	4	5	6

1	2	3	4	5	6	7
7	1	2	3	4	5	6
6	7	1	2	3	4	5
5	6	7	1	2	3	4
4	5	6	7	1	2	3
3	4	5	6	7	1	2
2	3	4	5	6	7	1

The order of the numbers in the first rank being determined; if, in beginning with the second rank, the second number 2, or the last number 7, should be pitched upon in one of these cases, and repeated; and in the other case, the other diagonal would be false unless the number repeated seven times should happen to be 4; for four times seven is equal to the sum of 1, 2, 3, 4, 5, 6, 7: and in general, in every square consisting of an unequal number of terms, in arithmetical progression, one of the diagonals would be false according to these two constructions, unless the term always repeated in that diagonal were the middle term of the progression. It is not, however, at all necessary to take the terms in an arithmetical progression; for, according to this method, one may construct a magic square of any numbers at pleasure, whether they be according to any certain progression or not. If they be in an arithmetical progression, it will be proper, out of the general method, to except those two constructions which produce a continual repetition of the same term in one of the two diagonals, and only to take in the case in which that repetition would prevent the diagonal from being just; which case being absolutely disregarded when we computed that the square of 7 might have 20,160 different constructions, it is evident, that by taking that case in, it must have vastly more.

To begin the second rank with any other number besides the second and the last, must not, however, be looked on as an universal rule. It holds good for the square of 7; but if the square of 9, for instance, were to be constructed, and the fourth figure of the first horizontal rank were pitched on for the first of the second, the consequence would be, that the fifth and eighth horizontal ranks would likewise commence with the same number, which would therefore be repeated three times in the same vertical rank, and occasion other repetitions in all the rest. The general rule, therefore, must be conceived thus: Let the number in the first rank pitched on for the commencement of the second, have such an exponent for its quota; that is, let the order of its place be such that, if an unit be taken from it, the remainder will not be any just quota part of the root of the square, that is, cannot divide it equally. If, for example, in the square of 7, the third number of the first horizontal rank be pitched on for the first of the second, such construction will be just; because the exponent of the place of that number, viz. 3, subtracting 1, that is, 2, cannot divide 7. Thus also might the fourth number of the same first rank be chosen, because 4 —1, or 3, cannot divide 7; and, for the same reason, the fifth or sixth number might be taken; but in the square of 9, the fourth number of the first rank must not be taken, because 4 —1, or 3, does divide 9. The reason of this rule will appear very evident, by considering in what manner the returns of the same numbers do or do not happen, taking them always in the same manner in any given series. And hence it follows, that the fewer divisions the root of any square to be constructed has, the more numerous are the different modes of constructing it; and that the prime numbers, *i. e.* those which have no divisions, as 5, 7, 11, 13, &c. are those whose squares will admit of the most variations in proportion to their quantities.

The squares constructed according to this method have some particular properties not required in the problem; for the numbers that compose any rank parallel to one of the two diagonals, are ranged in the same order with the numbers that compose the diagonal to which they are parallel. And as any rank parallel to a diagonal must necessarily be shorter, and have fewer cells, than the diagonal itself, by adding to it the corresponding parallel, which has the number of cells by which the other falls short of the diagonal, the numbers of these two parallels, placed as it were end to end, still follow the same order with those of the diagonal; besides that their sums are likewise equal, so that they are magical on another account. Instead of the squares which we have hitherto formed by horizontal ranks, one might also form them by vertical ones; the case is the same in both.

First Primitive.

1	2	3	4	5	6	7
3	4	5	6	7	1	2
5	6	7	1	2	3	4
7	1	2	3	4	5	6
2	3	4	5	6	7	1
4	5	6	7	1	2	3
6	7	1	2	3	4	5

All that we have hitherto said regards only the first primitive square, whose numbers, in the proposed example, were 1, 2, 3, 4, 5, 6, 7; there still remains the second primitive, whose numbers are 0, 7, 14, 21, 28, 35, 42. M. de la Hire proceeds in the same manner here as in the former case; and this may likewise be constructed in 20,160 different modes, as containing the same number of terms with the first. Its construction being made, and of consequence all its ranks making the same sum, it is evident, that if we bring the two into one, by adding together the numbers of the two corresponding cells of the two squares, that is, the two numbers of the first of each, the two numbers of the second, of the third, &c. and dispose them in the forty-nine corresponding cells of a third square, it will likewise be magical in regard to its rank, formed by the addition of equal sums to equal sums, which must of necessity be equal amongst themselves. All that remains in doubt is, whether or no, by the addition of the corresponding cells of the two first squares, all the cells of the third will be filled in uch a manner that each not only contains one of the numbers of the progression from 1 to 49, but also that this number be different from any of the rest, which is the end nd design of the whole operation.

Second Primitive.

0	7	14	21	28	35	42
21	28	35	42	0	7	14
42	0	7	14	21	28	35
14	21	28	35	42	0	7
35	42	0	7	14	21	28
7	14	21	28	35	42	0
28	35	42	0	7	14	21

As to this it must be observed, that if, in the construcion of the second primitive square, care has been taken, in he commencement of the second horizontal rank, to oberve an order with regard to the first, different from what was observed in the construction of the first square; for nstance, if the second rank of the rst square began with the third erm of the first rank, and the second rank of the second square commence with the fourth of the rst rank, as in the example it actually does; each number of the rst square may be combined once, and only once, by addition with all he numbers of the second. And the numbers of the first are here 2, 3, 4, 5, 6, 7, and those of the econd, 0, 7, 14, 21, 18, 35, 42; by combining them in is manner we have all the numbers in the progression om 1 to 49, without having any of them repeated; which the perfect magic square proposed.

Perfect Square.

1	9	17	25	33	41	49
24	32	40	48	7	8	16
47	6	14	15	23	31	39
21	22	30	38	46	5	13
37	45	4	12	20	28	29
11	19	27	35	36	44	3
34	42	43	2	10	18	26

The necessity of constructing the two primitive squares a different manner does not at all prevent each of the 20,160 constructions of the one from being combined with all the 20,160 constructions of the other; of consequence, therefore, 20,160 multiplied by itself, which makes 406,425,600, is the number of different constructions that may be made of the perfect square, which here consists of the forty-nine numbers of the natural progression. But as we have already observed that a primitive square of seven numbers repeated may have above 20,160 several constructions, the number 406,425,600 must come vastly short of expressing all the possible constructions of a perfect magic square of the forty-nine first numbers.

As to the even squares, M. de la Hire constructs them, like the uneven ones, by two primitive squares; but the construction of primitives is different in general, and may be so a great number of ways; and those general differences admit of a great number of particular variations, which give as many different constructions of the same even square. It seems scarcely possible to determine exactly, either how many general differences there may be between the construction of the primitive squares of an even square and an uneven one, or how many particular variations each general difference may admit of; and, of consequence, we are still far from being able to determine the number of different constructions of all those that may be made by the primitive squares.

Dr Franklin seems to have carried this curious speculation farther than any of his predecessors in the same way. He has constructed not only a magic square of squares, but likewise a magic circle of circles. The details are not, however, of such importance as to require particular notice in this place.

MAGICIAN, one who practises magic, or has the power of performing wonderful feats by the agency of spirits.

MAGINDANAO, the most southerly of the Philippine Islands, in the Eastern Seas, and situated principally between the sixth and tenth degrees of north latitude. It is of an extremely irregular shape, and may be estimated at 300 miles in length by 105 in average breadth. This island is of a very singular shape, having three remarkable promontories, one near Samboangan to the westward, Cape St Augustine to the eastward, and Surigao to the northward. It may be divided into three parts, under distinct and independent governments; the first, under the sultan, who resides at the town of Mindanao or Selangan, formerly comprehending the greater part of the sea-coast; the second, under the Spaniards, comprehending a large portion of the sea-coast to the west, north, and north-east, where they have settled colonies of Christians from the Philippines; the third, under the sultans or rajahs, who inhabit the banks of the Great Lake, or Lano, and thence a good way inland towards the hills. This island is so remarkably indented by the sea, that it is extremely favourable to piracy, and has always been the haunt of pirates. The interior of the island is intersected by lofty chains of mountains, with intervening plains, which afford pasture for vast herds of cattle. The country is well watered and well wooded, and covered towards the sea-coast with impenetrable jungle and forests. Rice is abundantly produced, also yams, sweet potatoes, and generally all the fruits common to the tropical climates. Gold is found in the sands of the rivers, and in the mountains. The exports consist of wax, rice, cassia, rattans, tobacco, pepper, &c. All sorts of cloth are here in great demand, especially long cloth, white and blue, and red handkerchiefs of all kinds; chintz, with dark grounds; Surat goods, and all kinds of European cutlery. Many articles of Chinese manufacture have been imported. The inhabitants have not made any great advances in civilization. They can manufacture nothing beyond a common nail. They are, however, much given to cock-fighting. The women do not suffer the same confinement as in other eastern countries.

Magellan first took possession of this island in 1521, in the name of Charles V.; and the Spaniards made some settlements, and subdued the northern coast, but never made any farther progress, and now with difficulty retain their feeble colonies. It was visited by the Portuguese about the year 1537, and by the Dutch in 1607, 1616, and 1627. The intercourse of the British with this island has not been frequent. The pirates, by whom it is inhabited, made an attack on the British settlements on Prince of Wales Island in 1788, and were repulsed with loss. In 1798 the sultan seized a boat's crew of a British frigate, who were afterwards ransomed. In 1803 they fitted out a fleet of prows with a view of invading the Company's settlements in Celebes, when they were met by the Swift cruiser, and dispersed with great loss. Long. 119. 30. to 125. E. Lat. 5. 40. to 9. 55. N. The principal town of the island is of the same name, and the residence of the sultan. It is situated about six miles up the Pelangy or Magindanao River, and forms, properly speaking, one town with Selangan, which is on the opposite side of the river, communicating by several bridges. It extends about one mile down the river Pelangy, forming a tolerable street, about half the distance. Long. 124. 40. E. Lat. 7. 9. N.

MAGISTERY, an old term in chemistry, given to precipitates. Thus, *magistery* and *precipitate* are synonymous; formerly precipitate was a general term, and magistery applied to particular precipitates, such as the magistery of bismuth, and the like.

MAGISTRATE, any public officer to whom the executive power of the law is committed, either wholly or in part.

MAGLIABECHI, Antonio, a person of great learning, and remarkable for an amazing memory, was born at Florence in the year 1633. His father died when he was only seven years of age. His mother had him taught grammar and drawing, and then put him as apprentice to one of the best goldsmiths in Florence. When he was about sixteen years old, his passion for learning began to appear; and he laid out all his money in buying books. Becoming acquainted with Michel Ermini, librarian to the Cardinal de' Medici, he perfected himself by his assistance in the Latin tongue, and in a little time became master of the Hebrew. His name soon became famous amongst the learned. A prodigious memory formed his distinguishing talent; and he retained not only the sense of what he had read, but frequently all the words, and the very manner of spelling. It is said that a gentleman, to make trial of the force of his memory, lent him a manuscript he was going to print. Some time after it was returned, the gentleman, going to him with a melancholy countenance, pretended it was lost, and requested Magliabechi to recollect what he remembered of it; upon which he wrote the whole, without missing a word. He generally shut himself up the whole day, and opened his doors in the evening to the men of letters who came to converse with him. His attention was so absorbed by his studies, that he often forgot the most urgent wants of nature. Cosmo III. grand duke of Florence, made him his librarian; but he still continued negligent in his dress, and simple in his manners. An old cloak served him for a morning gown in the day, and for bed-clothes at night. The duke, however, provided for him a commodious apartment in his palace, which he was with difficulty persuaded to take possession of, but which he quitted four months afterwards, and returned to his house. He was remarkable for his extraordinary modesty, his sincerity, and his beneficence, which his friends often experienced in their wants. He was a patron of men of learning, and had the highest pleasure in assisting them with his advice and information, and in furnishing them with books and manuscripts. He had the utmost aversion to any thing that looked like constraint, and therefore the grand duke always dispensed with his personal attendance, and sent him his orders in writing. Though he lived a very sedentary life, he reached the eighty-first year of his age; and died amidst the regrets of the public, after enjoying, during the latter part of his life, such affluence as few have ever procured by their learning. By his will, he left a very fine library to the public, with a fund for its support. See the article Libraries.

MAGLIANO, a town of the province of Mondovi, in Piedmont, containing 1680 inhabitants.

MAGLOIRE, St, a native of Wales, in Great Britain, and cousin-german to St Sampson and St Mallo. He embraced a monastic life, and went into France, where he was made abbot of Dol, and afterwards provincial bishop in Bretagne. He subsequently founded a monastery in the island of Jersey, where he died on the 14th of October 575, about the age of eighty. His remains were transported to the suburb of St Jacques, and deposited in a monastery of Benedictines, which was ceded to the fathers of the Oratory in 1628. It became the seminary of St Magloire, and celebrated on account of the learned men whom it has produced. This saint cultivated poetry with considerable success, the hymn which is sung at the feast of All Saints, *Cœlo quos eadem gloria consecrat,* having been composed by him.

MAGNAC-LAVAL, a town of France, in the department of the Upper Vienne, and arrondissement of Ballac, situated on the river Brame, and containing 2850 inhabitants.

MAGNANIMITY denotes greatness of mind, particularly in circumstances of trial and adversity. It has been justly observed, that it is pride in the good sense, and the noblest way of acquiring applause. It renders the soul superior to the trouble, disorder, and emotion, which the appearance of great danger might excite; and it is by this quality that heroes maintain their tranquillity, and preserve the free use of their reason, amidst the most dreadful accidents. It admires the same quality even in an enemy; and fame, glory, conquests, desire of opportunities to pardon and oblige their opponents, are the emotions which glow in the minds of the brave.

MAGNESIA, a town of Asia Minor, situated on the Mæander, about fifteen miles from Ephesus. Themistocles died at Magnesia, which was one of the three towns given him by Artaxerxes, "to furnish his table with bread." It is also celebrated for a battle which was fought there, 190 years before the Christian era, between the Romans and Antiochus king of Syria. It was founded by a colony from Magnesia in Thessaly; and was commonly called *Magnesia ad Mæandrum,* to distinguish it from another called *Magnesia ad Sipylum,* in Lydia, at the foot of Mount Sipylus.

MAGNETICAL Island, an island in the Southern Pacific Ocean, near the north coast of New Holland, discovered by Captain Cook in 1770, and so named from its having some effect on the compass. Long. 213. 22. W. Lat. 19. 8. S.

MAGNETISM.

The word magnetism is derived from the Greek word *μαγνης*, a name given to the *loadstone* or *native magnet*, an ore of iron well known to the ancients. The term *μαγνης* itself is said to be derived from one *Magnes*, a Greek shepherd, who observed on Mount Ida the attractive power which the loadstone exercised upon his iron crook. The most probable supposition however is, that it took its name from *Magnesia*, a country in Lydia, where it was first discovered; and this conjecture is confirmed by the fact that the magnet was often called by the ancients *Lapis Heracleus*, from *Heraclea*, the capital of *Magnesia*.

The science of magnetism treats of the phenomena exhibited by magnets, whether natural like the loadstone, or artificial like bars of steel to which magnetism has been permanently communicated;—of their reciprocal action upon each other; of the laws of the forces which they develope; of the methods of making artificial magnets; and of the magnetic phenomena exhibited by the globe which we inhabit.

In giving an account of this interesting science, which has made rapid progress in modern times, we shall adopt the following arrangement:

1. On the history of magnetical discovery.
2. On the general phenomena and principles of natural and artificial magnets.
3. On the magnetism of bodies not ferruginous.
4. On the development of magnetism in bodies by rotation.
5. On the influence of heat on magnetism.
6. On the action of iron spheres on the needle.
7. On the influence of magnetism on chemical action.
8. On the laws of magnetic forces.
9. On terrestrial magnetism.
10. On the different methods of making artificial magnets.
11. On magnetical instruments and apparatus.
12. On the theories of magnetism.

CHAP. I.—ON THE HISTORY OF MAGNETICAL DISCOVERIES.

The attractive power of the natural magnet or loadstone over small pieces of iron seems to have been known from the remotest antiquity. It is distinctly referred to by Homer, Pythagoras, and Aristotle. Pliny mentions a chain of iron rings suspended from one another, the first being upheld by the loadstone; and he relates that Dinocares proposed to Ptolemy Philadelphus to build, at Alexandria, a temple, the vault of which, crowned with loadstones, should suspend in the air an iron statue of Queen Arsinöe. St Augustin likewise makes mention of a statue suspended in the air in the middle of the temple of Serapis at Alexandria. From references made to the magnet by Euripides, Claudian, and others, and from the experiment with the rings mentioned by Pliny,[1] it is not very improbable that the ancients were acquainted with the communicability of magnetism to iron bodies. The magnetical properties of the loadstone, like the electrical ones of amber, were supposed to be miraculous. Medical qualities of various kinds were ascribed to it; and even Hippocrates ranks it amongst the number of purgatives.

History.

In order to explain the properties of the loadstone, Thales, Anaxagoras, and others, supposed it to have a soul; while some conceived that it was surrounded with an emanation, capable of creating a vacuum, into which the iron precipitated itself.

Invention of the compass.

In his description of China, Duhalde has stated that the directive power, or polarity, of the magnet, was known to the Chinese in the earliest ages, and that the needle had been employed to guide travellers by land a thousand years before Christ; and it is stated by Humboldt, that, according to the *Peuthsaoyani*, a treatise on Medical Natural History, written under the Saong dynasty, 400 years before Columbus, the Chinese suspended the needle by a thread, and found it to decline to the south-east, and never to rest at the true south point.

Although the common properties of the loadstone were known to the ancients, and were no doubt studied even during the dark ages, yet, notwithstanding the claims of the Chinese and Arabians, the directive power of the loadstone, or of a needle touched or rubbed by it, seems to be the discovery of modern times. Are Frode, an Icelandic historian, who was born in the year 1068, and who must have written his *Landnamabok*, or history of the discovery of Iceland, about the end of the eleventh century, mentions, in the most unequivocal manner, the directive power of the loadstone as known in his day. He states that Floke Vilgerderson, a renowned viking or pirate, departed from Rogoland in Norway, to seek Gadersholm or Iceland, some time in the year 868. He carried with him three ravens as guides, and, to consecrate them for this purpose, he offered up a sacrifice in Smörsund, where his ship lay. "*For*," says Frode, "*in those times seamen had no loadstone*[2] *in the northern countries*."

A. D. 868.

That the mariner's compass was known in the twelfth century, about the year 1150, is proved by notices of it in various authors, particularly in an old French poem called *La Bible Guyot*, which is contained in a curious quarto manuscript of the thirteenth century, still existing in the Royal Library at Paris. Guyot of Provins, the author of this poem, was alive in 1181. After referring to the ways by which navigators are guided in their course, and mentioning the pole star, he adds,

Un art font qui mentir ne peut,
Par la vertue de la marinière,
Un pierre laide et brunière
Où le fers volontiers se joint,
Ont regardent lor droit point.

That is, "they possess a never-failing method, by the virtue of the marinière, an ugly and brown stone, to which iron adheres of its own accord." The author next adds, that this art consists in rubbing a needle on the *marinière;* and that the point of this needle turns just against the pole-star in dark nights, when neither star nor moon are seen.

Quant il nuit est ténèbre et brune,
Quand ne voit estoile ne lune,
Lor font à l'aiguille allumer,
Puiz ne peut ils assorer,
Contre l'estoile va le pointe,
Par se sont il mariner cointe,
De la droit voie tems:
C'est un art qui ne peut mentir.

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[1] Sola hæc materia (ferrum) vires ab eo lapide accipit, retinetque longo tempore, aliud apprehendens ferrum, ut annulorum catena spectetur interdum, quod imperitum vulgus ferrum appellat vivum.

[2] *Leidarstein*, or *Leading Stone*, from which our word *Loadstone* is derived.

History.

A. D. 1200.

Cardinal James de Vitri, who flourished about the year 1200, mentions the magnetic needle in his History of Jerusalem; and he adds, that it was of indispensable utility to those who travelled by sea.

That the mariner's compass was known to the northern nations in 1266, appears from Torfæus's History of Norway, where it is mentioned that Jarl Sturla's poem on the death of the Swedish count Byrgeres was rewarded with a mariner's compass. The directive property of the magnet is also distinctly mentioned in an epistle of Petrus Peregrinus de Marcourt, written about the latter end of the thirteenth century. This letter was addressed "Ad Sigerium de Foueancourt militem de magnete." This epistle contains a description of the loadstone, the means of finding its poles, and its property of attracting iron; and it proves that *the part of the magnet which is turned to the north attracts that which is turned to the south.*

Paulus Venetus. A. D. 1260.

Peter Adsiger.

A Neapolitan named Flavio Gioia, who lived in the thirteenth century, has been regarded by many as the inventor of the compass. Dr Gilbert affirms that Paulus Venetus brought the compass from China to Italy in 1260. Ludi Vestomannus asserts, that about 1500 he saw a pilot in the East Indies direct his course by a magnetic needle like those now in use. One of the earliest treatises on magnetism is a Latin letter of Peter Adsiger, contained in a volume of manuscripts in the library of the university of Leyden. This letter, which appears to have been written for the instruction of a friend, is in reality a methodical treatise, in two parts, the first of which is subdivided into ten, and the second into three chapters. In the second chapter of the second part, the mariner's compass, and the method of constructing it, are clearly described; and, what is still more interesting, the author not only mentions the declination of the magnetic needle, but had observed its actual deviation from the meridian. "Take notice," says he, "that the magnet, as well as the needle which has been touched by it, does not point exactly to the poles; but that part of it which is reckoned to point to the south inclines a little to the west, and that part which looks towards the north inclines as much to the east. The exact quantity of this declination I have found, after numerous experiments, to be *five degrees.* However, this declination is no obstacle to our guidance, because we make the needle itself decline from the true south by nearly one point and a half towards the west. A point, then, contains five degrees." Mr Christie seems to consider the authenticity of this manuscript as doubtful, because no new observation of the declination seems to have been made for two centuries afterwards; and because the declination should be westerly in place of easterly in 1269, according to the best law of the change which can be deduced from subsequent observations.

Columbus. A. D. 1492.

Variation discovered.

The declination or the variation of the needle, thus distinctly described by Adsiger, if his manuscript is authentic, must be considered as well known before the time of Columbus, to whom the discovery of it has been generally ascribed. His son Ferdinand states, that on the 14th of September (13th according to Mr Irving) 1492, his father, when about two hundred leagues from the island of Ferro, noticed for the first time the variation of the needle; "a phenomenon," says Washington Irving, "which had never before been remarked." "He perceived," adds this author, "about nightfall, that the needle, instead of pointing to the north star, varied but half a point, or between five and six degrees to the north-west, and still more on the following morning. Struck with this circumstance, he observed it attentively for three days, and found that the variation increased as he advanced. He at first made no mention of this phenomenon, knowing how ready his people were to take alarm; but it soon attracted the attention of the pilots, and filled them with consternation. It seemed as if the laws of nature were changing as they advanced, and that they were entering another world, subject to unknown influences. They apprehended that the compass was about to lose its mysterious virtues; and, without this guide, what was to become of them in a vast and trackless ocean? Columbus tasked his science and ingenuity for reasons with which to allay their terrors. He told them that the direction of the needle was not to the polar star, but to some fixed and invisible point. The variation was not caused by any failing in the compass, which, like the other heavenly bodies, had its changes and revolutions, and every day described a circle round the pole. The high opinion that the pilots entertained of Columbus as a profound astronomer gave weight to his theory, and their alarm subsided."[1] Although the details which we have already given afford sufficient proof that the variation of the needle had been discovered two hundred years before the time of Columbus, yet it is evident, from the above passage, that he had discovered the variation of the variation, or that the variation was not a constant quantity, but varied in different latitudes.

Change in the variation.

Notwithstanding these casual observations on the variation of the compass, no accurate measures of its amount were made till about the middle of the 16th century. In 1541 it was found that the declination of the needle from the meridian of Paris was about 7° or 8° easterly. In 1550 it was 8° or 9°, and in 1580 $11\frac{1}{2}$° easterly. Norman,[2] who first observed the variation in London, made it 11° 15′ easterly; and Mr Burough,[3] comptroller of the navy, in 1580 found it to be at an average 11° 19′ E. at Limehouse. The following observations made at other places will show the gradual change in the variation.

Burough	1580	11°	19′	E. Limehouse.
Gunter	1612	5	36	E. London.
Gellibrand[4]	1633	4	4	E. London.
Petit	1630	4	30	E. Paris.
Petit	1660	0	10	E. Paris.
Auzout	1670	2	0	W. Rome.
Hevelius	1642	3	5	W. Dantzig.
Hevelius	1670	7	20	W. Dantzig.

Dip of the needle discovered. A. D. 1576.

The important discovery of the *dip* or inclination of the needle was made in 1576, by Robert Norman, whom we have already mentioned. Having constructed many compasses, and having always balanced the needles for them before he touched them with the magnet, he invariably found, that after they were touched, the north point always inclined below the horizon, so that he was obliged to make the card of the compass level, by putting some small pieces of wire on the end of it. Having mentioned this discovery to some of his friends, he was advised to construct an instrument which would enable him to measure the greatest angle which it would make with the horizon. With this instrument, which is the dipping needle in its first and rudest form, he found the dip to be at 71° 50′; an observation which, according to Bond, must have been made about 1576.

That ferruginous substances always possess a greater or tory History.

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[1] Irving's *Life and Voyages of Columbus*, vol. i. p. 201.

[2] *The New Attractive*, by Robert Norman, Lond. 1596.

[3] *A Discourse on the Variation of the Compass.* Lond. 1581.

[4] Discourse Mathematical on the Variation of the Magnetical Needle, 1635. Gellibrand found that the north-east of the needle was gradually moving to the westward.

a less degree of magnetism, has been long known. One Julius Cæsar, a surgeon of Rimini, first observed the conversion of iron into a magnet. In 1590 he noticed this effect on a bar of iron which had supported a piece of brickwork on the top of a tower of the church of St Augustin. The very same fact was observed about 1630, by Gassendi, on the cross of the church of St John at Aix, which had fallen down in consequence of having been struck with lightning. He found the foot of it wasted with rust, and possessing all the properties of a loadstone.

lbert 1600

While magnetism was making slow advances by means of insulated observations, it was destined to receive a vigorous impulse from the pen of Dr Gilbert of Colchester. This eminent individual, who was physician in ordinary to Queen Elizabeth, published, in 1600, his *Physiologia Nova, seu Tractatus de Magnete et Corporibus Magneticis*, a work which contains almost all the information concernng magnetism which was known during the two followng centuries. It relates chiefly to the natural loadstone, and to artificial magnets, or bars of steel which have acquired similar properties. He applies the term magnetic to all bodies which are acted upon by loadstones and magnets, in the same manner as they act upon each other, and he finds that all such bodies contain iron in some state or ther. He considers the phenomena of electricity as havng a considerable resemblancc to those of magnetism, hough he points out the differences by which the two classes f phenomena are marked. In treating of the directive power of the needle, he supposed, "that the earth itself being in all its parts magnetical, and the water not, wherver the land was, there would the needle turn, as to the reater quantity of magnetical matter." He regarded the earth as acting upon a magnetised bar, and upon iron, like a magnet, the directive power of the needle being produced by the action of magnetism of a contrary kind to hat which exists at the extremity of the needle directed owards the pole of the globe. He gave the name of *pole* o the extremities of the needle which pointed towards the poles of the earth, conformably to his views of terrestrial magnetism, calling the extremity that pointed towards the *north* the *south pole* of the needle, and that which pointed o the *south* the *north pole*.

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About the year 1650, Mr Bond, a teacher of mathematics in London, who had been employed to superintend the publication of the popular treatises on navigation, published work called the *Seaman's Calendar*, in which he maintains that he has discovered the true progress of the deviation of the compass; and in another book, called *The Longitude Found*, and in the *Phil. Trans.* 1668, he published a table of the computed variations for London for many years to come, extending from 1663 to 1716. The results which his table contains agree very nearly with those which were observed for the next twenty-five years, but after that the differences became very great. In a subsequent paper in the *Phil. Trans.* for 1673, Bond attempted to account for he change in the variation and dip of the needle, by supposing *that the two magnetic poles revolved round the poles f the earth.* He asserted that he knew the period of his revolution, as well as its cause; and he proposed to determine the longitude by means of the dip of the needle. He did not, however, think proper to communicate either is views or method to the public.

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Newton, Huygens, Hooke, and some of the other philosophers who flourished about the end of the seventcenth century, were occupied, though not to a great degree, with he subject of magnetism. Some of their observations and discoveries are referred to in a manuscript volume of notes nd commentaries, written by David Gregory in 1693, in a copy of Newton's *Principia*, and used by Newton in improvng the second edition. Newton had supposed that the law f magnetic action approaches to the inverse triplicate ratio of the distance; but Gregory did not adopt this opinion, and invalidates the arguments which were used in its support. Newton committed another mistake in asserting, as we shall afterwards see, that red hot iron has no magnetic property.

Dr Hooke. A. D. 1684.

Several interesting experiments had been made by Dr Gilbert, on the effects of heat in destroying magnetism, and also in inducing it in substances susceptible of being impregnated. He likewise made numerous experiments with bars of iron and steel placed in the magnetic meridian and exposed to great heats. Dr Hooke took up this subject in 1684. He used rods of iron and steel about seven inches long and one fifth of an inch in diameter, and he found that they acquired permanent magnetism when strongly heated in the magnetic meridian, and allowed to cool in the same position. The permanency of the effect was greater, and the magnetism stronger, when the rods were suddenly cooled in cold water, so as to give them a very hard temper. He found that the end which was next to the north, or the lower end of a vertical bar, was invariably a permanent north pole. Even when the upper end alone was quenched, while the rest of the bar cooled slowly, that end became a sensible south pole. If the same process was adopted when the steel bar lay at right angles to the magnetic meridian, no magnetism was acquired.

Dr Halley. A. D. 1683.

The subject of terrestrial magnetism now occupied the attention of our eminent countryman Dr Edmund Halley; and in 1683 he published his *Theory of Magnetism*, which to a certain extent forms the nucleus of more modern hypotheses. He regarded the earth's magnetism as caused by four poles of attraction, two of them near each pole of the earth; and he supposes "that in those parts of the world which lie nearly adjacent to any one of these magnetic poles, the needle is governed thereby, the nearest pole being always predominant over that more remote." He supposes that the magnetic pole, which was in his time nearest Britain, was situated near the meridian of the land's end, and not above 7° from the north pole; the other north magnetic pole being in the meridian of California, and about 15° from the north pole of the earth. He placed one of the two south poles about 16° from the south pole of the globe, and 95° west from London; and the other, or the most powerful of the four, about 20° from the south pole, and 120° east of London.

Dr Halley's theory.

In order to account for the change in the variation, Dr Halley, some years afterwards, added to these reasonable suppositions the very extraordinary one, that our globe was a hollow shell, and that within it a solid globe revolved, in nearly the same time as the outer one, and about the same centre of gravity, and with a fluid medium between them. To this inner globe he assigned two magnetic poles, and to the outer one other two; and he conceived the change in the variation of the needle to be caused by a want of coincidence in the times of rotation of the inner globe and the external shell. "Now, supposing," says he, "such an external sphere having such a motion, we may solve the two great difficulties in every former hypothesis; for if this exterior shell of earth be a magnet, having its poles at a distance from the poles of diurnal rotation, and if the internal nucleus be likewise a magnet, having its poles in two other places, distant also from its axis, and these latter, by a gradual and slow motion, change their places in respect of the external, we may then give a reasonable account of the four magnetic poles, as also of the changes of the needle's variation." From some reasons which Dr Halley then states, he concludes "that the two poles of the external globe are fixed in the earth, and that if the needle were wholly governed by them, the variation would be always the same, with some little irregularities; but the internal sphere, having such a gradual translation of its poles, influences the needle, and directs it variously, according to the result of the attractive and directive power of each pole, and consequently there must be a period of revolution of this internal ball, after which the variation will return as before."

This theory excited so much notice, that an application was made to William and Mary, for a ship, "in order to seek, by observation, the discovery of the rule for the variation of the compass." The command of a ship of the royal navy was in consequence given to Dr Halley; and, in the accomplishment of the object which he had in view, he performed two voyages, one in 1698 and the other in 1699, in which he traversed various parts of the Pacific and Atlantic Oceans, and obtained such a number of valuable results, that he completed a chart of the variation of the needle, which exhibited to the eye the general law of its phenomena.

Graham. A. D. 1722.

Daily variation discovered.

The very important discovery of the daily variation of the needle was made in 1722, by Mr Graham, a celebrated mathematical instrument maker in London. While the needle was advancing by an annual motion to the westward, Mr Graham found that its north extremity moved westward during the early part of the day, and returned again in the evening to the eastward, to the same position which it occupied in the morning, remaining nearly stationary during the night. Mr Graham at first ascribed these changes to defects in the form of his needles; but, by numerous and careful observations, repeated under every variation of the weather and of the heat and pressure of the atmosphere, he concluded that the daily variation was a regular phenomenon, of which he could not find the cause. It was generally a maximum between ten o'clock A. M. and 4 o'clock P. M., and a minimum between six and seven o'clock P. M. Between the 6th February and the 12th May 1722, he made a thousand observations in the same place, from which he found that the greatest westerly variation was 14° 45′, and the least 13° 50′; but in general it varied between 14° 35′ and 14°, giving 35′ for the amount of the daily variation.

Law of the magnetic force.

The law of the magnetic force, or the rate at which it varies with the distance, had, as we have seen, occupied the attention of Sir Isaac Newton and David Gregory. Numerous experiments were made by various authors for the same purpose, a large collection of which have been published by Scarella, in his treatise *De Magnete*, published at Brescia in 1759. Muschenbroeck made a great number of experiments with the same view; but as the joint action of the four poles was never considered, the precise law of variation remained unknown.

Hauksbee and Brooke Taylor.

Mr Hauksbee and Dr Brooke Taylor employed a much better method, namely, the deviation of a compass-needle from the meridian, produced by the action of a magnet at different distances; but the magnets which they used had improper shapes, and the conclusion which they drew from their experiments was, that the magnetic force decreased much quicker at great distances than at small ones, and that it is different in different loadstones.[1]

Mr Michell.

Notwithstanding this strange conclusion, the observations to which we have referred were of great value; and Mr Michell[2] succeeded in deducing from them, in 1750, the true law of magnetic action. "There have been," says Mr Michell, "some who have imagined that the decrease of the magnetic attraction and repulsion is inversely as the cubes of the distances; others, as the squares; and others, that it follows no certain ratio at all, but that it is much quicker at great distances than at small ones, and that it is different in different stones. Among the last is Dr Brooke Taylor and Muschenbroeck, who seem to have been pretty accurate in their experiments. The conclusions of these gentlemen were drawn from their experiments, without their being aware of the third property of magnets just mentioned, which, if they had made proper allowances for, together with the increase and diminution of power in the magnets they tried their experiments with, all the irregularities they complained of (as far as appears from their relations of them) might very well be accounted for, *and the whole of their experiments coincide* with the squares of the distances inversely."

Torsion balance.

It is to Mr Michell also that we owe the introduction of the torsion balance, for measuring small forces; an instrument which, as we shall see, was employed with singular success and dexterity by Coulomb in his electrical, magnetical, and hydrodynamical researches: and the science of magnetism is no less indebted to Mr Michell for his invention of the method of double touch, as it is called, by which artificial magnets may be made with greater strength than could have been obtained from the previous method of Duhamel.

Descartes.

The hypothesis of Descartes, who explained the polarity of the needle by means of currents moving rapidly from the equator to the poles, was adopted and defended by Euler and Daniel Bernoulli; but we cannot afford any space for such useless speculations. Euler afterwards occupied himself more advantageously for science in attempting to investigate mathematically the direction of the needle on every part of the earth's surface.[3] Perceiving the intricacy which would arise from the adoption of four poles, as imagined by Halley, he tried the effect of employing two poles not diametrically opposite; and he found, that when a proper position was given them, the variation under the same meridian might be both easterly and westerly, as in Halley's chart. The solution which he has given is founded on the principle, "that the magnetic direction on the earth follows always the small circle which passes through the given place, and the two magnetic poles of the earth;" or that the horizontal needle is a tangent to the circle passing through the place of observation, and through the two points on the earth's surface where the dipping needle becomes vertical, or the horizontal needle loses its directive power. In the application of this principle, Euler makes four different suppositions respecting the magnetic poles: 1. That they are diametrically opposite to each other; 2. that they are in opposite meridians, but not in opposite parallels; 3. that they are on the same meridian; and, 4. that they have every other situation whatever. The first of these suppositions he finds to be quite irreconcileable with the observed phenomena, but in the other three he finds that the variation may be both easterly and westerly in the same meridian. By successive approximations he finds the position of the two magnetic poles in 1757 to be as follows: The north pole in latitude 76° north, and longitude 96° west from Teneriffe; and the south pole in latitude 58° south, and longitude 158° west from Teneriffe. To this dissertation Euler has added a chart of the curves of equal variation, calculated on the preceding principles, and suited to 1757; and their general accordance with observation is very surprising. In a subsequent dissertation Euler endeavoured to improve his theory, by supposing the two magnetic poles to be at the surface of the earth. The chord joining these poles he calls the magnetic axis, and the middle point of that chord its magnetic centre. Then, if we draw a line from the place of observation to the magnetic centre, and consider this as the base of an isosceles triangle, one of whose sides is the magnetic axis, the other side will be the direction of a freely suspended needle. This hypothesis, though it has various defects, fulfils, as has been well remarked, certain conditions that are essential to a good theory. 1. It gives the needle the approximately accurate positions at the equator, the needle and the axis being then parallel; 2. it fulfils the condition of the needle and axis, forming a continuous line at the poles; 3. it furnishes two points at which the needle would be vertical; and, 4. it gives a series of positions, single for each place, and having a certain, and oftentimes pretty close, approach to the true position.[1]

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[1] *Phil. Trans.* No. 368, 396.

[2] *A Treatise of Artificial Magnets*, 8vo, Lond. 1750, p. 19.

[3] *Berlin Memoirs*, 1757, 1766.

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The law of magnetic action occupied the particular attention of M. Lambert, the celebrated Prussian philosopher, who has published an account of his labours in the Memoirs of the Academy of Berlin for 1756. Having placed a mariner's compass at various distances from a magnet, and in the direction of its axis, he observed the declination of the needle produced by the magnet, and the obliquity of the magnet to the needle's axis. From several observations at different obliquities, he found that the action of magnetism on a lever was proportional to the sine of the angle of its obliquity to the axis of the lever or needle. M. Lambert then proceeded to study the effect of distance, and he discovered that the force of a magnet is proportional to the distance of the nearest pole of the magnet from the centre of the needle, diminished by the square of a constant quantity, nearly equal to two thirds of the length of the needle. This result he found to be true with magnets ten times larger, and needles twice as short; but as the law led him to a strange result, as if the action on a magnet were exerted from a centre beyond itself, he was therefore obliged to take another method of determining the law of action, namely, by a series of experiments on the directive power of the magnet,[2] from which he inferred, "that the force of each transverse element of a magnet is as its distance from the centre, and its action as a particle of another magnet inversely as the square of the distance." By means of this law he calculates the position of a very small needle, and draws three of the curves to which it should be a tangent, and these coincide very accurately with some of those which he had observed.

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Our learned countryman Dr Robison had been pursuing similar inquiries before he had seen Lambert's experiments. He got some magnets made, composed of two balls connected by a slender rod; and after magnetising them strongly, he found that the force of each pole resided nearly in the centre of the ball. In this way the attractive and the directive powers of the magnets were easily computed, and the result was, that the force of each pole was inversely as the square of the distance. In no case did the error of this hypothesis amount to one fifteenth of the whole, and in the calculation for the phenomena of the directive power the errors were still smaller. When Dr Robison had seen Lambert's second memoir, he repeated all his former experiments in Lambert's manner, taking the precaution of keeping the needle in its natural position, which he had not previously attended to; and the results which he now obtained were still more conformable to his conjecture as to the law of variation. Dr Robison tried another method of ascertaining the law of magnetic action. In 1769 or 1770 he constructed a needle of two balls joined by a slender rod, and having touched it with great care, so as to keep the whole strength of the poles near the centre of the balls, he counted the number of oscillations which it performed horizontally in a given time by the force of the earth's magnetism. "He then placed it on the middle of a very fine and large magnet, placed with its poles in the magnetic meridian, the north pole pointing south. In this situation he counted the vibrations made in a given time. He then raised it up above the centre of a large magnet, till the distance of its poles from those of the great magnet was changed in a certain proportion. In this situation its vibrations were again counted. It was tried in the same way in a third situation, considerably more remote from the great magnet. Then having made the proper reduction of the forces corresponding to the obliquity of their action, the force of the poles of the great magnet was computed from the number of vibrations." The results of these experiments were the most consistent with each other of any that Dr Robison made for determining the law of the magnetic force, and it was chiefly from them that he thought himself authorized to say with some confidence, that it is inversely as the square of the distance. When Dr Robison, however, observed, some years afterwards, that Æpinus, in 1777, conceived the force to vary inversely as the simple distance, he repeated the experiments with great care, and added another set made with the same magnet, and the same needle placed at one side of the magnet instead of above it. By this arrangement, which greatly simplified the process, the result of the whole was still more satisfactory. The inverse law of the square of the distance was therefore well established.

Theory of Æpinus.
A. D. 1759.

Various speculations respecting the cause of the phenomena of magnetism had been hazarded by different authors; but it was reserved for M. Æpinus to devise a rational hypothesis, which embraced and explained almost all the phenomena which had been observed by previous authors. This hypothesis, which he has explained at great length in his *Tentamen Theoriæ Electricitatis et Magnetismi*, published in 1759, may be stated in the following manner.

1. In all magnetic bodies there exists a substance which may be called the magnetic fluid, whose particles repel each other with a force inversely as the distance.

2. The particles of this fluid attract the particles of iron, and are attracted by them in return with a similar force.

3. The particles of iron repel each other according to the same law.

4. The magnetic fluid moves through the pores of iron and soft steel with very little obstruction; but its motion is more and more obstructed as the steel increases in hardness or temper, and it moves with the greatest difficulty in hard-tempered steel and the ores of iron.

Methods of making artificial magnets.

The method of making artificial magnets, which was practised by the philosophers of the seventeenth century, was a very simple but a very inefficacious one. It consisted in merely rubbing the steel bar to be magnetised, upon one of the poles of a natural or artificial magnet, in a direction at right angles to the line joining the poles of the magnet. Towards the middle of the eighteenth century, however, the art of making artificial magnets had excited general attention; and it is to Dr Gowin Knight, an English physician, that we are indebted for the discovery of a method of making powerful magnets. This method he kept secret from the public, but it was afterwards published by Dr Wilson. Duhamel, Canton, Michell, Antheaume, Savery, Æpinus, Robison, Coulomb, Biot, Scoresby, and others, made various improvements on this art, as will be minutely described when we arrive at that part of our subject.

Experiments of Canton.
A. D. 1756.

The science of magnetism owes many obligations to Mr John Canton, one of the most active experimental philosophers who adorned the middle of the eighteenth century. In or previous to the year 1756, he made no fewer than 4000 observations on the diurnal variation of the needle, with the view of determining its amount, and investigating its origin. He found the daily change different in different seasons of the year, as shown in the following table.

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[1] See an excellent paper on Terrestrial Magnetism, in the *Magazine of Popular Science*, May 1836, No. iv. p. 223, 224.

[2] *Memoirs of the Berlin Academy*, vol. xxii.

January	7′ 8″	July	13′ 14″
February	8 58	August	12 19
March	11 17	September	11 43
April	12 26	October	10 36
May	13 0	November	8 9
June	13 21	December	6 58

He found also that the time of minimum westerly variation at London was between eight and nine o'clock A. M., and the time of maximum between one and two o'clock P. M., the needle returning to its morning position about eight or nine in the evening. A series of similar observations were made with nearly the same results by Mr Van Swinden; but this excellent observer discovered, that some time before the hour in the morning when the westerly minimum took place, and after the same hour in the evening, a motion of the needle both to the eastward and westward took place; that is, the morning westerly variation is sometimes preceded by a small easterly variation, and the principal easterly variation in the evening is followed by a small westerly variation.

Van Swinden.

Canton explained the westerly variation of the needle, and the subsequent easterly motion, by supposing that the heat of the sun, acting upon the eastern parts of the earth, weakens their influence, as heat is known to do that of a magnet, and consequently the needle will move to the westward. In the same way, as the sun warms the western side of the earth in the afternoon, the needle will then take a contrary direction.

Discoveries of Coulomb.

One of the ablest cultivators of the science of magnetism was the celebrated Coulomb, who, by the application of the principle of torsion, first used by Michell, determined the correct law of magnetic attractions and repulsions.[1] After measuring with great nicety, by the torsion balance, the force requisite to make a magnetic bar suspended horizontally deviate any number of degrees from a given position, he was enabled to verify the discovery of Lambert already mentioned, that the effect of terrestrial magnetism is proportional to the sine of the angle which the magnetic meridian forms with the axis of the magnet upon which it acts. By making the homologous poles of two magnetised wires repel each other, he observed the force of torsion which was necessary to overcome certain quantities of their mutual repulsion, and, at the distances 12°, 17°, and 24°, he found that the repulsive forces were as the numbers 3312, 1692, and 864, deviating little from 3312, 1650, and 828, which they would have been had the repulsive force varied in the inverse ratio of the square of the distance. The excess of 42 and 36 in the experimental numbers was owing to the circumstance that it was not a particle, but a portion, of each wire, from which the repulsive force emanated, so that the force of the other particles being exerted less obliquely, and therefore being stronger at greater distances, ought to produce an excess such as that actually observed. A similar result was obtained when the contrary poles of the magnetised wires were made to attract each other; so that Coulomb concluded that the attractive and repulsive forces exercised by two magnetic particles are inversely as the square of their distances, a result which he confirmed by several other methods than that which we have noticed.

Distribution of magnetism.

Provided with such a delicate instrument as the torsion balance, Coulomb was enabled to apply it with singular advantage to almost every branch of the science. His first object was to determine the law according to which magnetism is distributed in a magnetic bar. It was of course well known that the magnetism in the middle of the bar was imperceptible, and that it increased according to a regular law, and with great rapidity, towards each of its poles. By suspending a small proof needle with a silk fibre, and causing it to oscillate horizontally, opposite different points of a magnetic bar placed vertically, Coulomb computed the part of the effect which was due to terrestrial magnetism, and the part which was due to the action of the bar; and in this way he obtained the following results, which show the extreme rapidity with which magnetism is increased towards the poles.

Discoveries of Coulomb.

Distances from the north end of the Bar.	Intensity of the Magnetism at these distances.
0 inches	165
1	90
2	48
3	23
4·5	9
6	6

In examining the distribution of electricity in a circular plane, Coulomb found that the thickness of the electric stratum was almost constant from the centre to within a very small distance of the circumference, when it increased all on a sudden with great rapidity. He conceived that a similar distribution of magnetism took place in the transverse section of a magnetic bar; and, by a series of nice experiments with the torsion balance, he found this to be the case, and established the important fact, that the magnetic power resides on the surface of iron bodies, and is entirely independent of their mass.

Effects of temperature.

The effect of temperature on magnets was another subject to which Coulomb directed his powerful mind; but he did not live to give an account of his experiments, which were published after his death by his friend M. Biot. Coulomb found that the magnetism of a bar magnetised to saturation diminished greatly by raising its temperature from 12° of Reaumur to 680°; and that when a magnetic bar was tempered at 780°, 860°, and 950°, of Reaumur, the development of its magnetism was gradually increased, being more than double at 900° of what it was at 780°. He found also that the directive force of the bar reached its maximum when it was tempered at a bright cherry-red heat at 900°; and that at higher temperatures the force diminished. It is to Mr Barlow, however, as we shall presently see, that we are indebted for the complete investigation of the influence of temperature on the development of magnetism.

Method of making artificial magnets.

Coulomb made many valuable experiments on the best methods of making artificial magnets, and he subjected all the various processes that had been previously employed to the test of accurate measurement. His experiments on the best forms of magnetic needles are equally valuable; but the most interesting of his researches, and the last to which he devoted his great talents, were those which relate to the action of magnets upon all natural bodies. Hitherto, iron, steel, nickel, and cobalt, had been regarded as the only magnetic bodies; but, in the year 1802, Coulomb announced to the Institute of France, that all bodies whatever are subject to the magnetic influence, even to such a degree as to be capable of accurate measurement. The substances employed by Coulomb were in the form of a cylinder or small bar, about one third of an inch in length and one thirtieth in thickness, and they were suspended by a single fibre of silk between the opposite poles of two powerful steel magnets, placed in the same straight line, and having their opposite poles at a distance exceeding by a quarter of an inch the length of the cylinders. The cylinders were then made to oscillate between the poles of the magnets, and were

Universal magnetism.

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[1] See our article ELECTRICITY, p. 586, where the torsion balance is minutely described.

ory.

protected from all motions of the air by a glass receiver. The result of these experiments was, that whatever was the substance of the cylinders, they always arranged themselves in a line joining the poles of the magnets, and returned to that position whenever they were deflected from it. These experiments were made with cylinders of gold, silver, copper, lead, tin, glass, wood, chalk, bone, and every variety of substance, organic and inorganic. The only explanation which Coulomb could give of these phenomena was, either that all bodies whatever were susceptible of magnetism, or that they contained small portions of iron or other magnetic metals, which communicated to them the property of obeying the magnet. In order to investigate this subject, MM. Sage and Guyton prepared highly purified needles of the different metals, and M. Coulomb found that the momenta of the forces with which they were solicited by the magnets were as follows:—

Lead	0·00674
Tin	0·00591
Silver	0·00520
Gold	0·00406
Copper	0·00406

he momentum of torsion alone, for all the needles, being 0·00136, a little more than a fourth of the action which he magnets exert upon the needles.

In order to determine if these phenomena were owing o particles of iron disseminated through the bodies, Couomb fabricated needles out of three different mixtures of white wax and iron filings, and he found that the forces exerted by magnets upon these needles were proporional to the absolute quantities of iron which they conain. Coulomb now tried a needle of silver, purified by cupellation, and another needle of silver alloyed with $\frac{1}{20}$th part of iron, and he found that the action of the magnet upon the former was 415 times less than upon he latter. Hence there will be 415 times less iron in he pure than in the impure silver; and since the latter ontains $\frac{1}{320}$th part of its weight of iron, the first will ontain $\frac{1}{415}$th of $\frac{1}{320}$th, or $\frac{1}{132800}$th, or it will contain 32799 parts of pure silver and one of iron, a quantity of lloy beyond the reach of chemical detection.

boldt.

Amongst the scientific travellers who contributed to our nowledge of terrestrial magnetism, Baron Alexander Humboldt was one of the most distinguished. Himself n accurate and scientific observer, and possessed of nice nstruments and methods of observation, he made numeous accurate observations on the dip and variation of the eedle in various parts of the earth, and particularly near he magnetic equator; and, by means of these valuable ata, M. Biot was enabled to throw much light on the ubject of terrestrial magnetism. Hitherto the magnetic oles had been considered as either on or very near the urface of the earth; but as it had been found impossible o deduce the phenomena of the variation and dip of the eedle, philosophers were led to consider the situation of hese poles as indeterminate. M. Biot was the first to dopt this view of the subject; and after numerous comarisons, he came to the conclusion, that the nearer these oles were placed to each other, the greater was the greement between the computed and observed results; nd by considering the two poles as indefinitely near each ther in the centre of the earth, the computed and oberved measures approximated as closely as could be exected. Hence it was inferred that the phenomena of errestrial magnetism were not such as are produced by ermanently magnetic bodies, but those rather that arise rom simple iron or ferruginous masses, which are only temporarily magnetic. In this manner M. Biot was led to express the law of terrestrial magnetism in a complicated formula, which represented the observations with wonderful accuracy.

History.

Professor Krafft.

In the year 1809, Professor Krafft of St Petersburg undertook the very same inquiry, and after comparing the same observations which were used by Biot, with the respective situations of the places where they were obtained, he arrived at the following simple law: "If we suppose a circle circumscribed about the earth, having the two extremities of the magnetic axis for its poles, and if we consider this circle as a magnetic equator, the tangent of the dip of the needle, in any magnetic latitude, will be equal to double the tangent of this latitude." Upon re-examining his former formula, M. Biot found that it was reducible to the above simple law, a coincidence which may be considered as giving it additional confirmation.

Professor Hansteen.

One of the most zealous and successful cultivators of magnetical science is Professor Hansteen of Christiania, who published, in 1817, an able work on the magnetism of the earth.[1] The Royal Society of Denmark proposed, in 1811, the prize question, "Is the supposition of one magnetical axis sufficient to account for the magnetical phenomena of the earth, or are two necessary?" Professor Hansteen's attention had been previously drawn to this subject by seeing a terrestrial globe, on which was drawn an elliptical line round the south pole, and marked *Regio Polaris magnetica*, one of the foci being called *Regio fortior*, and the other *Regio debilior*. As this figure professed to be drawn by Wilcke, from the observations of Cook and Furneaux, Hansteen was led to compare it with the facts; and the result of the comparison being favourable, he was induced to study the theory of Halley, which had previously appeared to him wild and extravagant. The result of his researches, however, was favourable to that part of Halley's theory which assumes the existence of four poles and two magnetic axes. Hansteen's Memoir, which was crowned by the Danish Society, forms the groundwork of the larger volume which he published in 1817. In his fifth chapter, on the Mathematical Theory of the Magnet, he deduces the law of magnetic action from a series of experiments similar to those of Hauksbee and Lambert. Assuming that the attraction or repulsion between any two magnetic particles is directly as the intensity of the force, and inversely as some unknown power t of the mutual distance of these particles, and supposing that the magnetic intensity of any particle is proportional to some power r of its distance a from the centre of the magnet, he finds the following expression for the effect F, which a linear magnet would have upon a magnetic point situated anywhere upon the axis produced:

$$F = \int \frac{x^r\,dx}{(a-x)^t} - \int \frac{x^r\,dx}{(a+x)^t};$$

x being the length of half the axis of the linear magnet, and F (multiplied by a constant quantity, depending on the degrees of magnetism which the point and line possess) representing the force. In conducting the experiments, Hansteen placed a very sensible compass upon a horizontal table, so that the needle pointed to 0°. From beneath the centre of this needle, and perpendicular to its direction, or to the magnetic meridian, he drew a straight line upon the table, and divided it into portions, so that *ten* of them were equal to the half axis a of the artificial magnet. This magnet was then placed on the line at different distances from the needle, and the deviation of the needle from the magnetic meridian which it produced was accurately observed for each distance. Upon com-

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[1] *Untersuchungen über den Magnetismus der Erde*, 4to. Christiania, 1817.

Hansteen's researches.

paring the results, and calculating them by the formula, upon the supposition that t was 1 or 3, the differences were very great; but by making $t = 2$, the calculated and observed results agreed remarkably well, as the following table shows:

Values of a, or Distances in half Axes of the Magnet.	Values of F, or Increase of the Force.			
	Observed Values.	Calculated Values.		
		$t = 2$ $r = 1$	$t = 2$ $r = 2$	$t = 2$ $r = 3$
11	1·000	1·000	1·000	1·000
10	1·306	1·334	1·334	1·325
9	1·834	1·835	1·836	1·836
7	3·947	3·938	3·945	3·949
5	11·015	11·072	11·119	11·154
4	22·441	22·245	22·411	22·530

From this remarkable coincidence between the observed and the computed results, Hansteen concludes that "*the attractive or repulsive force with which two magnetic particles affect each other, is always directly as their intensities, and inversely as the squares of their mutual distance.*" He shows that the undetermined value of r produces almost no effect at considerable distances; and he is inclined to think that $r = 2$, or that *the absolute intensity of any magnetic particle, situated in the axis, is proportional to the square of its distance from the middle point of that axis.* Mr Hansteen has also demonstrated that *the distance from the middle of a magnet being the same, the force opposite the poles, or in the direction of the axis, is double of the force in the magnetic equator.* If a globe contains at its centre an infinitely small magnet, Hansteen shows that, *near the magnetic equator, the dip must increase twice as rapidly as the magnetic latitude, and, near the pole, half as rapidly;* and that *the increment of the dip must be equal to the alteration of the latitude of that part of the globe where the dip is* 54° 44′. Our author also states, that if the earth had only one magnetic axis, whose centre coincided with that of the earth, the lines of equal dip would coincide with those of equal intensity; but as this is far from being the case, his opinion that there are two magnetic axes becomes more probable.

The most valuable part, however, of Professor Hansteen's work is that which relates to the number, position, and revolution of the magnetic poles. Having collected all the observations of value that had been made on the variation of the needle, he proved that there were *four points* of convergence among the lines of variation, viz. a weaker and a stronger point in the vicinity of each pole of the globe. The strongest poles N, S, lie almost diametrically opposite to each other, and the same is true of the weaker poles *n, s*. These four poles he found to have a regular motion obliquely, the two northern ones N, *n*, from west to east, and the two southern ones S, *s*, from east to west. The following he found to be their periods of revolution, and their positions, in 1830:—

	Lat.	Long. from Greenwich.	Time of Revolution round each Pole of the Globe.
Pole N	69° 30′ N.	87° 19′ W.	1740 years.
Pole S	68 44 S.	131 47 E.	4609 do.
Pole *n*	85 6 N.	144 17 E.	860 do.
Pole *s*	78 29 S.	137 45 W.	1304 do.

Since the publication of these results, Professor Hansteen had access to the valuable series of magnetical observations made during the British voyages of discovery to the arctic regions; and, after a diligent comparison of them, he obtained new and more accurate determinations of the positions and periods of revolution of the four magnetic poles, but still differing so little from his previous determinations, as to give a high degree of probability to the correctness of the results. He finds from Captain Parry's observations, that in 1819 the pole N must have been situated in north lat. 71° 27′, and the time of its revolution 1890 (in place of 1740, as formerly calculated). The period of revolution of S he changed from 4609 to 4605, and that of *s* from 1304 to 1303, that of *n* remaining at 860 as before. Professor Hansteen considers N and S as the terminating points of one magnetic axis, and *n* and *s* those of the other axis; and he remarks that these two axes cross each other without intersection, or without passing through the centre of the earth. In reference to the causes of these singular changes, our author considers it possible that the illumination and heating of the earth, during one revolution about its axis, may produce a magnetic tension, as it produces the electrical phenomena. In support of his hypothesis of four poles, Professor Hansteen has shown very clearly that the changes in the variation and dip of the needle in both hemispheres may be well explained by their motion; but we cannot here enter into these details.

With the view of discovering the nature of the forces by which the phenomena of terrestrial magnetism are produced, Professor Hansteen resolved to ascertain, at different parts of the earth's surface, the *intensity* of its magnetism, and to determine the form of the lines of equal intensity, or, as he calls them, the *isodynamical magnetic lines.* By means of the same needle intrusted to different philosophers, he had observations on the number of its oscillations in a given time made in every part of Europe; and he afterwards undertook a journey to Siberia to make the observations himself in that interesting magnetical region. From these observations he deduced the following law, according to which the magnetic intensity varies with the dip of the needle:—

Magnetic Dip.	Magnetic Intensity.
0°	1·0
24	1·1
45	1·2
64	1·3
73	1·4
$76\frac{2}{3}$	1·5
81	1·6
86	1·7

Professor Hansteen's journey to Siberia was attended with secondary consequences of great value to science. The attention of the Russian government, and the Academy of Sciences at St Petersburg, was thus called to the subject of magnetism; and, on the recommendation of Baron Humboldt, the emperor liberally agreed to erect magnetic observatories in suitable stations, for determining, every *ten* years, the exact position of the *two lines of the variation* which pass through his empire.

In determining the intensity of terrestrial magnetism, Professor Hansteen observed that the time of vibration of a horizontal needle varied during the day. Graham had previously suspected a change of this kind, but his methods were not accurate enough to prove it. Hansteen, however, found that the *minimum* intensity took place between 10 and 11 A. M., and the *maximum* between 4 and 5 P. M. He concluded also that there was an annual variation, the intensity being considerably greater in winter near the perihelion, than in summer near the aphelion; that the greatest *monthly* variation was a maximum when the earth is in its perihelion or aphelion, and a minimum near the equinoxes; and that the greatest daily variation is least in winter and greatest in summer. He found also that the aurora borealis weakened the magnetic force, and that the magnetic intensity is always weakest when the moon crosses the equator. In making experiments in the round tower at Copenhagen, he found that the magnetic intensity increased regularly towards the top, where it was a maximum;[1] and having extended his observations, he obtained the general result, that at the foot of any vertical object the needle oscillates *quicker* at the *north* side of it, and *slower* at the *south* side; whereas at the upper end it oscillates *quicker* at the *south* side, and *slower* at the *north* side.

In the aerostatic ascent of MM. Gay-Lussac and Biot, they were unable to detect any change in the intensity of terrestrial magnetism at the height of 4000 metres. Saussure, however, had found that the intensity was considerably less on the Col du Géant than at Chamouni and Geneva, the difference in the levels of these places being in the one case 10,000 and in the other 7800 feet, but his observations contradict his conclusion. M. Kupffer has more recently obtained a similar result by observations on Mount Elbrouz, having found a decrease of intensity in rising 4500 feet above his first station; and he explains the result obtained by MM. Gay-Lussac and Biot by supposing that an increase of intensity was produced by the diminution of temperature. Mr Henwood, on the other hand, has made observations at the surface of Dolcoath mine, at 1320 feet beneath its surface, and on a hill 710 feet above the level of the sea, without being able to detect any difference in the intensity. To the late Captain Foster[2] we owe many valuable observations on the magnetic intensity made at Spitzbergen and elsewhere. From these he concluded, that the diurnal change in the horizontal intensity is principally, if not wholly, owing to a small change in the amount of the dip. The maximum took place at about 3h. 30′ A. M., and the minimum at 2h. 47′ P. M., its greatest change amounting to one eighty-third of its mean value. Captain Foster is of opinion that these changes have the sun for their primary agent, and that his action is such as to produce a constant inflexion of the pole towards the sun during the 24 hours, an idea which Mr Christie had previously stated.[3]

About the year 1818, Professor Barlow of Woolwich turned his attention to the subject of magnetism, with the view principally of calculating the effect of a ship's guns on the compass. In trying the effects of different iron balls, he was led to the curious facts, that there exists round every globe and mass of iron a great circle inclined to the horizon at an angle equal to the complement of the dip of the needle; that the plane of this circle is a plane of no attraction upon a needle whose centre is in that plane; that if we regard this circle as the magnetic equator, the tangent of the deviation of the needle from its north or south pole will be proportional to the rectangle of the sine of the double latitude, and cosine of the longitude; that when the distance of the needle is variable, the tangent of deviation will be reciprocally proportional to the cube of the distance; and that, all things else being the same, the tangents of deviation will be proportional to the cubes of the diameters of the balls or shells, whatever be their masses, provided their thickness exceed a certain quantity.

These results were published in the first edition of Mr Barlow's *Essay on Magnetic Attractions*; but in the second edition of that work, he has published some curious results respecting the relative magnetic power of different descriptions of iron and steel, and on the effect of temperature on the quality and quantity of the attractive power of iron. The results of the first of these series of experiments were as follow, the numbers expressing the proportional magnetic power of the different descriptions of iron and steel.

History.

Mr Barlow's discoveries.

Malleable iron	100	Shear steel, hard	53
Blistered steel, soft	67	Cast iron	48
Blistered steel, hard	53	Cast steel, soft	74
Shear steel, soft	66	Cast steel, hard	49

In his experiments on the effects of temperature, Mr Barlow found that every kind of iron and steel possessed a greater capacity for the development of its magnetism when softened by heat than when cold; from which he concludes that its complete development when cold is prevented only by the hardness or resisting power of the metal. At a *white* heat he found that iron lost entirely its magnetic power, a result apparently inconsistent with the preceding conclusion; but, what was a still more extraordinary circumstance, when the *white* heat, at which there was no magnetism, began to subside into a *bright red*, or *red* heat, an *attractive* power showed itself, the *reverse* of what it had when cold; and after it had passed through these two shades of colour, it resumed the same attractive power which it had when cold, the passage from the negative attraction of red passing into the positive attraction of the cold metal at the point of a red heat, the maximum, however, taking place at a blood-red heat.

Mr C. Bonnycastle.

The experimental laws of attraction of an iron shell or sphere, obtained by Mr Barlow, were first examined theoretically by Mr Charles Bonnycastle, who deduced them mathematically from the theory of Æpinus, which supposes the two magnetic fluids to be accumulated in the poles of magnets. This theory, however, led to some improbable consequences, and therefore Mr Barlow was induced to adopt that of Coulomb and Biot, with the modification, *that the magnetic power all resides on the surface of iron bodies, and is independent of the mass;* a modification which enabled Mr Barlow to obtain a general analytical expression of the disturbing power of an iron ball at its surface, as compared with that of the earth, and from which he deduced theoretically all his experimental laws.

These important discoveries enabled Mr Barlow to invent a most ingenious method of correcting the error of the compass, arising from the attraction of all the iron on board ships. This source of error had been noticed by Mr Wales, Mr Downie in 1794, and by Captain Flinders; but it is to Mr Bain[4] that we owe the distinct establishment and explanation of this source of error. As a hollow shell of iron about four pounds in weight acts as powerfully at the same distance as a solid iron ball of 200 pounds weight, Mr Barlow happily conceived that a plate of five or six pounds weight might be made to represent and counteract the amount of the attraction of all the iron on board a vessel, and therefore leave the needle as free to obey the action of terrestrial magnetism as if there were no iron in the ship at all. After this ingenious contrivance had been submitted to the admiralty, it was tried in every part of the world; and even in the regions which surround the magnetic pole, where the compass becomes useless, it never failed to indicate the true magnetic direction when the connecting plate was properly applied. At Port Bowen, where the dip is 88°, and the magnetic intensity which acts upon a horizontal needle extremely weak, the azimuth compass on board Captain Parry's ship gave the very same variation as that observed on shore. "Such an invention as this," says Captain Parry, "so sound in principle, so easy of application, and so universally beneficial

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[1] The height of the tower is 126 feet.

[2] *Phil. Trans.* 1828.

[3] *Phil. Trans.* 1827, pp. 345-349.

[4] *Treatise on the Variation of the Compass.*

Mr Barlow's discoveries.

in practice, needs no testimony of mine to establish its merits; but when I consider the many anxious days and sleepless nights which the uselessness of the compass in these seas had formerly occasioned me, I really should have esteemed it a kind of personal ingratitude to Mr Barlow, as well as great injustice to so memorable a discovery, not to have stated my opinion of its merits, under circumstances so well calculated to put them to a satisfactory trial." For this beautiful invention, the Board of Longitude conferred upon Mr Barlow the highest reward of L.500; and the Emperor of Russia, who was never inattentive to the interests of science, sent him a fine gold watch and a rich dress chain, for the same contrivance.

Magnetism of rotation.

A series of beautiful discoveries was made about this time by M. Arago, Mr Christie, and Mr Barlow, on the influence of rotation on bodies both magnetic and non-magnetic. Mr Barlow, so early as 1818 or 1819, had found, that when a plate of iron was made to turn upon its centre, different parts of its circumference had different degrees of magnetic action on the compass; but here there was no effect discovered as due to rotation. In 1821, Mr Christie, in a series of experiments on iron plates, not only found that different parts in the circumference of the same plate had different attracting powers; but *that the same part had a different influence, according as the same plate was made to revolve to the right or left hand.* Mr Christie therefore discovered that there was a *deviation due to rotation*, and that magnetical effects were produced which were nearly independent of the velocity of rotation, and which continued after the rotation had ceased. When the rotation was very rapid, the forces exerted upon the needle were always in the same direction as the forces derived from the slowest rotation, and which continue to act after the rotation has ceased, the former being to the latter nearly as three to two. From all the observations made by Mr Christie, he considers that the direction of the magnetic polarity acquired by rotation, whether at right angles to the line of the dip or not, has always a reference to the direction of the terrestrial magnetic force; and he infers that this magnetism is communicated to it from the earth. "It does not therefore appear from this," says Mr Christie, "that a body can become polarised by rotation alone, independently of the action of another body; so that, if from these experiments we might be led to attribute the magnetic polarity of the earth to its rotation, we must at the same time suppose a source from which magnetic influence is derived. Is it not, then, possible that the sun may be the centre of such influence, as well as the source of light and heat, and that, by their rotation, the earth and other planets may receive polarity from it?" When these experiments were repeated at Port Bowen in 1825 by Captain Foster, the phenomena were exhibited on a more striking scale.

Mr Christie.

Mr Barlow.

In December 1824, Mr Barlow began a series of experiments, with the view of ascertaining whether magnetism, as produced by various processes with iron, could be excited or disturbed by rapid rotation. They were completed in January, but their publication was delayed till June, that an account of them might appear along with those of Mr Christie above mentioned. Mr Barlow's first experiments were made on a 13-inch shell attached to a lathe turned by a steam-engine, the mean speed of which was about 640 revolutions in a minute. The deviation of a needle exposed to its action increased with the velocity, and remained constant while the velocity continued constant, the needle always returning exactly to its original position the moment the motion of the ball ceased. This, therefore, is a phenomenon different from that observed by Mr Christie; a temporary effect wholly dependent on the velocity of rotation, whereas that observed by Mr Christie was permanent, and nearly independent of the number of revolutions. In examining the direction of the new force impressed upon the iron shell, he found it to be in every case equivalent to a polarisation at right angles to the axis of rotation.

Discoveries of M. Arago.

Previous to the publication of these experiments, and without any knowledge of them, M. Arago had made the remarkable discovery, that if plates of copper and other substances are put into rapid rotation beneath a magnetised horizontal needle freely suspended, the rotatory plate will first cause the needle to deviate from its true direction; and by increasing the velocity, the deviation will increase, till the needle passes the opposite point, when it will continue to revolve, and at last with such velocity that the eye is unable to distinguish it.

M. Arago was led to this beautiful discovery by a previous series of experiments of great interest. He found that a magnetic needle oscillating above or near any body whatever, such as a plate of metal or a surface of water, gradually oscillated in arcs of less and less amplitude, as if it had been placed in a resisting medium; and, what was particularly remarkable, the number of oscillations performed in a given time was not changed. This curious fact was announced to the Academy of Sciences in Paris on the 22d of November 1824; and he was hence conducted to the still more remarkable discovery of the effects of rotation which we have already mentioned.

Seebeck.

M. Seebeck of Berlin repeated the experiments of M. Arago on the influence of plates of metal and other substances in diminishing the amplitude of oscillation; but we must reserve our account of them till we come to the chapter on that subject.

Messrs Babbage and Herschel.

The experiments of M. Arago on the rotation of metallic plates were described and repeated by M. Gay-Lussac in London in the month of March or April 1825; and they excited so much attention, from their connection with the effects observed by Mr Barlow, that Mr Babbage and Mr Herschel immediately erected an apparatus for repeating them. In their first trial, the deviation of the needle did not exceed 10° or 11° with a revolving plate of copper. In order to enlarge the visible effect, they reversed the experiment, in order to try whether discs of copper and other non-magnetic substances might not be set in motion if suspended over a revolving magnet. A horse-shoe magnet, capable of lifting twenty pounds, was made to revolve rapidly about its axis of symmetry placed vertically. A circular disc of copper, six inches in diameter and one twenty-fifth of an inch thick, was suspended centrally over it, by a silk thread just capable of supporting it. A sheet of paper being interposed, and the magnet set in motion, the copper began revolving in the same direction, at first slowly, but with an accelerating velocity. On reversing the motion of the magnet, the velocity of the copper was destroyed gradually. It stopped for an instant, and then immediately began to revolve in the opposite direction. Screens of paper, glass, wood, copper, tin, zinc, lead, bismuth, were interposed betwixt the magnet and the copper, but they exerted no sensible interceptive power. But when tinned iron plate was interposed, the magnetic influence was greatly diminished by one plate, and almost annihilated by two thicknesses of it. A piece of iron connecting the two poles of the revolving magnet produced the same effect. The substances in which signs of magnetism were developed by the revolving magnet were copper, zinc, silver, tin, lead, antimony, mercury, gold, bismuth, and carbon in the state in which it is precipitated from carburetted hydrogen in gas-works. By getting plates of different metals cast in the same mould, they found that the proportional intensity of magnetic action for each respectively was as follows:

Zinc	1·11	Lead	0·25
Copper	1·00	Antimony	0·01
Tin	0·51	Bismuth	inappreciable.

M. Arago had observed the very remarkable fact, that if the disc of copper be cut from the circumference towards the centre, like radii, but without taking away the metal, the action upon the needle is greatly diminished. After verifying this result, Messrs Babbage and Herschel ascertained that re-establishing the metallic contact with other metals, restored, either wholly or very nearly, the original power of the plate, even though the soldering metal had a very feeble magnetic power. The law of the force, with a decrease of distance, they found to vary between the square and the cube. "The rationale," says Messrs Babbage and Herschel, "of these phenomena, as well as of those observed by Mr Barlow in the rotation of iron, which form only a particular case (though certainly the most prominent of any) of the class in question, seems to depend on a principle which, whether it has or has not been before entertained, or distinctly stated in words, it may be as well, once for all, to assume here, as a *postulatum*, viz. that *in the induction of magnetism, time enters as an essential element, and that no finite degree of magnetic polarity can be communicated to or taken from any body whatever, susceptible of magnetism, in an instant.*

The preceding results were verified by Mr Christie, who found, that when a thick plate of copper revolved under a small magnet, the force which deflected the needle varied inversely as the fourth power of the distance; but when the copper discs were small, and the magnets large, the power of the distance was between the square and the cube; when the plates were of different weights, the force was nearly in the ratio of the weights at small distances, but at smaller distances it varied in a higher ratio.

The discovery of two poles of maximum cold on opposite sides of the north pole of the earth, which was announced by Sir David Brewster in 1820, led him and other authors to the opinion that there might be some connection between the magnetic poles and those of maximum cold. "Imperfect," says he, "as the analogy is between the isothermal and magnetic centres, it is yet too important to be passed over without notice. Their local coincidence is sufficiently remarkable, and it would be to overstep the limits of philosophical caution to maintain that they have no other connection but that of accidental locality; and if we had as many measures of the mean temperature as we have of the variation of the needle, we might determine whether the isothermal poles were fixed or moveable." And he concludes his paper on the mean temperature of the globe with the following paragraph: "Having thus endeavoured to establish a new law of the distribution of heat over the surface of the globe, it might be no uninteresting inquiry to investigate the causes which have modified in so remarkable a manner the influence of the solar rays. The subject, however, is too comprehensive and too hypothetical to be discussed at present. How far the general form and position of the continents and seas of the northern hemisphere may disturb the natural parallelism of the isothermal lines to the equator,—to what extent the current through Behring's Strait, transporting the waters of warmer climates across the polar seas, may produce a warm meridian in the direction of its motion, and throw the coldest parts of the globe to a distance from the pole,—whether or not the magnetic, or galvanic, or chemical poles of the globe (as the important discoveries of Mr Oersted entitle us to call them), may have their operations accompanied with the production of cold, one of the most ordinary effects of chemical action,—or whether the great metallic mass which crosses the globe, and on which its magnetic phenomena have been supposed to depend, may not occasion a greater radiation of heat in those points where it developes its magnetic influence,—are a few points which we may attempt to discuss when the progress of science has accumulated a greater number of facts, and made us better acquainted with the superficial condition as well as the internal organization of the globe."[1]

The two poles of maximum cold, which will likely perform an important part in the future history of terrestrial magnetism, are situated, according to Sir David Brewster, as follows, according to the best observations made both near them and at a distance. The American pole is situated in latitude 73° north, and longitude 100° west from Greenwich, a little to the east of Cape Walker; and the Asiatic pole in latitude 73° north, and longitude 80° east, between Siberia and Cape Matzol on the Gulf of Oby. Hence the two warm meridians will be in west longitude 10° and east longitude 170°, the latter passing through Lord Mulgrave's range, and the former between St Helena and Ascension Island. The two cold meridians, or those which pass through the poles of maximum cold, will be in west longitude 100° and east longitude 80°, the latter passing near Mexico and through Bathurst Island, and the former through Colombo in Ceylon, Berar in Hindustan, and crossing the Oby a little to the west of Narym in Siberia. The following is the formula which the same author has given for the mean temperature at any point of the globe, T being the mean temperature required, t the maximum equatorial temperature, τ the minimum temperature at each of the cold poles, and δ, δ' the distances of the place from the two cold poles.

$$T = (t - \tau)\,(\sin.^n \delta \,.\, \sin.^n \delta') + \tau.$$

The distances δ, δ' are found from the formulæ

$$\cos. \delta = \frac{\cos. L\,(\cos. L - \theta)}{\cos. \theta} \text{ and}$$

$$\text{tang. } \theta = \cos. M \text{ tang. } L\,;$$

in which L is the colatitude of the pole of maximum cold, l the colatitude of the place, and M the difference of longitude between the place and the pole of maximum cold. The values of t and τ have been determined with considerable accuracy, t being nearly 82°·8 Fahrenheit, and τ from 0° to $-3\frac{1}{2}$°. The exponent n is nearly $\frac{5}{8}$ths, but future observations may induce us to increase or diminish it.

Now it is a remarkable circumstance that the same formula, *mutatis mutandis*, expresses the magnetic intensity of magnetism at any point of the earth's surface, the intensity at the two magnetic poles being supposed equal. If we call S the maximum number of seconds in which any number n of oscillations are performed which takes place at the island of St Thomas on the west coast of Africa, and s the minimum number of seconds in which n oscillations are performed which takes place at the magnetic poles, then the intensity I will be

$$I = (S - s)\,(\sin.^n \delta \sin.^n \delta') + s,$$

δ and δ' being determined by the formulæ already given, adopting the position of the poles in the preceding page. The values of S and s, according to Captain Sabine and Hansteen, will be about 370″ and $262\frac{1}{2}$″. This formula will give for the *isodynamical lines*, or those of equal intensity, a series of returning curves of the nature of Lemniscates, almost similar to those drawn by Captain Sabine, and given in a future figure, and exactly like the polar isothermal lines.

The connection thus indicated between the heat and the magnetism of the earth has been studied by succeeding authors, and the general principle has been adopted by many distinguished philosophers. Dr Traill expressed the opinion, "that the disturbance of the equilibrium of the temperature of our planet by the continual action of the sun's rays on its intertropical regions, and by the polar ices, must convert the earth *into a vast thermo-magnetic appara-*

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[1] *Edinburgh Transactions*, 1820.

Connection between the temperature and magnetism of the globe.

tus;" and "that the disturbance of the equilibrium of temperature even in stony strata may elicit some degree of magnetism." Mr Christie thinks it "not improbable that difference of temperature may be the primary cause of the polarity of the earth, though its influence may be modified by other circumstances." M. Ampère, who ascribes magnetism to transverse electrical currents, thinks that the strata of our globe may form considerable galvanic arrangements, and that the electric currents may be affected by the rotation of the earth. M. Oersted remarks, in a recent treatise on thermo-electricity, "that the most efficacious excitation of electricity upon the earth appears to be produced by the sun producing daily evaporation, deoxidation, and heat, all of which excite electrical currents." After stating that the sun daily produces electric currents, and these currents magnetism, he observes, that "thus the earth seems to have a *constant magnetic polarity*, produced in the course of time by the electrical currents which surround it, and a *variable magnetism*, produced immediately by the same current." As the sun produces different effects on water and solid bodies, Oersted supposes that the intensity will vary in the same parallel, and the direction of the needle will be oblique to the equator, in consequence of the lines of equal electro-magnetic intensity being twice bent by the influence of the two great masses of continent. "The yearly and daily change," he observes, "must occasion yearly and daily variations. As to the variations comprehended in greater periods, we might perhaps attribute them to a *motion of the coolest points in such continents*, which, it appears, cannot remain the same for ever, because the currents of warmer air must principally be directed to such points." Analogous views have been recently stated by M. Kupffer, in a memoir read in 1829 to the Russian Academy, in which he adopts explicitly Sir David Brewster's opinions of the existence of two cold poles distant from the pole of revolution. "But this distribution of temperature," says he, "*appears also to have a great influence on the distribution of the intensity of terrestrial magnetism.* This would no doubt be the case if it is true, as I have tried to show in another memoir, that terrestrial magnetism resides at the surface of the globe. We have here the choice between *two* hypotheses; either the earth should be considered as a magnet existing by itself, and then the intensity of its magnetism will be the inverse of its temperature; or it receives its influence from without, and is only like a piece of soft iron, to which the presence of a distant body communicates magnetism, and then the intensity of its magnetism will increase with its temperature. Though the first of these hypotheses has been hitherto generally adopted, yet the second acquires some probability from the discovery of the magnetic influence of the solar rays, and of the known relation between the diurnal variations of the declination of the needle and the course of the sun." The connection between the poles of maximum cold and those to which the isodynamical magnetic lines are related, is considered by Dr Dalton as a probable supposition. "If the idea," says he, "suggested by Sir David Brewster in the Transactions of the Royal Society of Edinburgh, vol. ix. 1821, be correct (and there seems great reason to believe it to be so), namely, *that there are two poles of greatest cold in the northern hemisphere*, the above observation will enable us to see the natural cause of this remarkable fact. The lands within the arctic circle, in the absence of the sun, must depend upon the south-west winds from the two great oceans for their winter heat. Those parts of the eastern and western continents which are most remote from the ocean, as measured along the curvilinear tracts of the current of air, must receive that air in great measure deprived both of its vapour and its temperature. Accordingly it is found that the temperature of the north-east parts of such continents exhibits the extreme of cold. Probably a latitude of 75° north, and a longitude of 90° east and 90° west, would be found nearly equally cold, and to exceed any other place on the surface of the globe in this respect; and it would be a curious coincidence if Professor Hansteen's two supposed northern magnetic poles should be found in the same positions as the two poles of extreme cold."[1]

Magnetism of the solar rays.

In a general history of magnetical discoveries, it may be proper to take some notice of the very curious experiments which have been made respecting the influence of the solar rays in the production of permanent magnetism, although, according to the generally received opinion, the existence of such an influence has not been established; but if the propriety of doing this had been doubtful, the observation just made by M. Kupffer, as connecting this supposed property of violet light with terrestrial magnetism, would have removed the doubt. Dr Morichini, an eminent physician in Rome, was the first who announced it as an experimental fact, that an unmagnetised needle could be rendered magnetic by the action of the violet rays of the sun. His experiments were successfully repeated by Dr Carpi at Rome, and the Marquis Ridolfi at Florence; but M. d'Hombre Firmas at Alais in France, Professor Configliachi of Pavia, and M. Bérard of Montpellier, failed in obtaining decided magnetic effects from the violet rays. In 1814 Dr Morichini exhibited the actual experiment to Sir Humphry Davy, and in 1817 Dr Carpi showed it to Professor Playfair. A few months after Sir Humphry witnessed the experiment, the writer of this article met him at Geneva, and learned from him the fact, that he had paid the most diligent attention to one of Morichini's experiments, and that he saw, with his own eyes, an unmagnetised needle rendered magnetic by violet light. The following account of the experiment made by Dr Carpi was given to us verbally by Professor Playfair, who approved of the statement of it which we drew up at the time. "The violet light was obtained in the usual manner, by means of a common prism, and was collected into a focus by a lens of a sufficient size. The needle was made of soft wire, and was found upon trial to possess neither polarity nor any power of attracting iron filings. It was fixed horizontally upon a support, by means of wax, and in such a direction as to cut the magnetic meridian at right angles. The focus of violet rays was carried slowly along the needle, proceeding from the centre towards one of the extremities, care being taken never to go back in the same direction, and never to touch the other half of the needle. At the end of half an hour after the needle was exposed to the action of the violet rays, it was carefully examined, and it had acquired neither polarity nor any force of attraction; but after continuing the operation twenty-five minutes longer, when it was taken off and placed on its pivot, it traversed with great alacrity, and settled in the direction of the magnetical meridian, with the end over which the rays had passed turned towards the north. It also attracted and suspended a fringe of iron filings. The extremity of the needle that was exposed to the action of the violet rays repelled the north pole of a compass-needle. This effect was so distinctly marked as to leave no doubt in the minds of any who were present, that the needle had received its magnetism from the action of the violet rays." In this state of the subject, Mrs Somerville made some simple and well-conducted experiments, which seemed to set the question at rest, from the distinct and decided

Morichini.

Carpi.

Mrs Somerville.

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[1] *Meteorological Observations and Essays*, second edition, 1834, p. 215.

character of the results. A sewing needle, an inch long, and devoid of magnetism, had one half of it covered with paper, and the other exposed to the violet rays of the spectrum, five feet distant from the prism. In two hours it acquired magnetism, the exposed end exhibiting north polarity. The *indigo* rays produced an equal effect, and the *blue* and *green* the same in a less degree. The *yellow*, *orange*, and *red* rays had no effect even after three days' exposure to their action. Pieces of blue watch-springs received a higher magnetism. When the sun's light fell upon the exposed end through blue coloured glass, or through *blue* or *green* riband, the same magnetic effects were produced.

The experiments of Mr Christie, an account of which was read to the Royal Society a short time before Mrs Somerville's, confirmed her results to a certain degree, by a different mode of observation. He found that the compound solar rays possessed magnetic influence, and exhibited it in their effect of diminishing the vibrations of magnetised and unmagnetised steel needles, and also needles of copper or of glass, by making them oscillate in the sun's white ray. Mr Christie, however, has recently remarked, that as his experiments have not succeeded on repetition by Mr Snow Harris, when made in a vacuum, his results must have been owing to currents of air. In justice to Mr Christie, however, we must mention, that Professor Zantedeschi repeated Mr Christie's experiments at Pavia, under an Italian sun, with a needle a Paris foot long, and obtained a striking result. This needle, when drawn from its position of equilibrium, through an area of 90°, performed four oscillations in 30″, the last of which had a semiamplitude of 70°. In the solar rays it performed in 30″ four oscillations, the last of which had only a semiamplitude of 60°. When he exposed to the sun the north pole, the semiamplitude of the last oscillation was 6° less than that of the first, while by exposing the south pole this last oscillation became greater than the first. The experiments of Baumgartner and Barlocci tended to confirm these results. The former found that iron wires polished on a part of their length are magnetised by white solar light, exhibiting a north pole on the polished part; and the latter has shown that an armed natural loadstone, which carried $1\frac{1}{2}$ Roman pound, exhibited, after three hours' exposure to the strong light of the sun, an increase of energy equivalent to 2 ounces or $\frac{1}{6}$th of a pound, while another larger one, which carried 5 pounds 5 ounces, had its strength nearly doubled by two days' exposure. Zantedeschi tried an artificial horse-shoe loadstone, which carried $13\frac{1}{2}$ ounces; after three days' exposure to the sun it carried $3\frac{1}{2}$ ounces more, and by continuing its exposure its power increased to 31 ounces. An oxidated magnet gained most power, and a polished one none. He found also that the north pole of a loadstone exposed to the sun's rays concentrated by a lens acquires strength, while its south pole, similarly exposed, loses it.

Notwithstanding all these results, the general opinion seems now to be, that light does not exercise any decided effect in producing magnetism. The experiments of MM. P. Ries and Moser were made with needles both polished and oxidated, and also with wires half-polished; and polarised as well as common light was made to fall upon them in a concentrated state, but no decided effect upon their number of oscillations could be observed; and they state that they think themselves justly entitled *to reject totally a discovery which, for seventeen years, has at different times disturbed science.*

In 1827, Mr Snow Harris communicated to the Royal Society of Edinburgh his *Experimental Inquiries concerning the Laws of Magnetic Forces*, made with a beautiful and accurate instrumental apparatus, invented by the author for examining the phenomena of induced magnetism. With this apparatus he found that the magnetic development in masses of iron by induction is, *cæteris paribus, directly proportional to the power of the inductive force, and inversely as the distance;* and that the forces which magnets develope in a mass of iron at a given distance, within certain limits, may be taken as a fair measure of their respective intensities. From another series of experiments he has shown, that the absolute force of attraction exerted between a magnet and a piece of iron, varies with the power of the magnet, and consequently with the force induced in the iron, *cæteris paribus;* and that when the force induced in the iron is a constant quantity, while its distance from a temporary or permanent magnet is variable, *the absolute force varies with the distance.* This result was not only apparent when the magnetic force was varied by induction, but was also satisfactorily shown when varied by magnets of which the relative powers of induction were previously ascertained. Mr Harris made a number of nice experiments on the absolute force of attraction and repulsion between two magnetised bodies, which he found to be in the inverse ratio of the square of the distance. When, in the case of attraction, the magnets, however, were nearly approximated in relation to their respective intensities, the increments in the forces began to decline, and in some instances at near approximations the absolute force was in the simple inverse ratio of the distance. In the experiments with the repelling poles, the deviations from the regular force were still more considerable, and, what is curious in this case, the force became less and less, until the polarity of the weaker magnet appeared to be so counteracted by induction, *that the repulsion was at length superseded by attraction.* Mr Harris next proceeded to determine the law according to which the forces are developed in different points of the longitudinal magnetic axis between the centre and poles of a magnet, and he found that it varied directly as the square of the distance from the magnetic centre; a law which is uniform in bars of steel regularly hardened and magnetised throughout. This law of distribution is exactly the same as that which has been given by Hansteen.

Mr Harris has also published other two memoirs in the Philosophical Transactions for 1831, the first *On the Influence of Screens in arresting the progress of Magnetic Action*, and the second *On the Power of Masses of Iron to control the Attractive Force of a Magnet*, of both of which some account will be found in a subsequent section. In his latest paper, *On the Investigation of Magnetic Intensity by the Oscillations of the Magnetic Needle*, he exposed an oscillating magnetic bar to a bright sunshine; and though he observed the effect observed by Mr Christie, which that philosopher ascribed to the influence of the sun's rays, yet he found that they all disappeared when the needle was made to oscillate in an exhausted receiver.

M.Haldat.
A. D. 1830.

M. Haldat of Nancy communicated, in 1830, to the society of that city, the results of some interesting researches on the incoercibility of the magnetic fluid, or its power of exerting its influence through all bodies, even the most dense; a property which is not possessed by light, heat, or electricity. In this research he adopted various methods of observation, and interposed a great variety of substances; and from the numerous experiments which he made, he has drawn the following conclusions: 1. That the agent or fluid by which the magnetic phenomena are explained is incoercible in the present state of the science; 2. that iron, considered as presenting an exception to this law, coerces the magnetic influences only by acquiring itself the magnetic state; 3. that incandescence does not give to bodies the power of coercing the magnetic influence. In a previous memoir, M. Haldat had obtained some interesting results on the production of magnetism by friction. He found that all hard bodies may, by means of friction, assist in the decomposition of the magnetic fluid, if their action is promoted by the combined action of magnets which, by themselves, are incapable of producing it. If a piece of soft wire, for example, four inches long, and 1-25th of an inch in diameter, is placed horizontally between two bar-magnets, with their opposite poles facing each other, and at such a distance that the wire cannot be magnetised, it will receive distinct magnetism by friction with all hard bodies, such as copper, brass, zinc, glass, hard woods, &c. M. Haldat employed the ingenious process of M. Gay-Lussac, of magnetising soft iron by torsion, in neutralising the wires before they were magnetised. If they are twisted after receiving magnetism, they will preserve the magnetism which they had received before torsion; but if, after being twisted, they are twisted in an opposite direction, they will become perfectly neutral.

M. Haldat likewise made some interesting experiments on the effect of the coercive force in steel on the magnetism produced by rotation, and he found that the force with which a revolving steel disc dragged round a magnetic needle was in the inverse ratio of the coercive force of the steel. When the discs were not hot, they had the same effect as those at the ordinary temperature. We owe also to M. Haldat an interesting paper on magnetic figures. Figures of any kind, when traced by the pole of a magnet on a plate of steel, are rendered visible by sifting upon the invisible tracings filings of steel, which arrange themselves in the most beautiful manner along the outlines of the figure which has been traced.

M. Quetelet.
A. D. 1830.

A series of very interesting experiments have been recently published by M. Quetelet of Brussels, *On the successive degrees of Magnetic Force which a Steel Needle receives during the multiple frictions which are employed to magnetise it.* These experiments were made principally before 1830, but they were not given to the public till 1833. The following are the general results which were obtained by the author.

1. When a needle or bar that had never been magnetised, is magnetised to saturation by the method of separate contact, the magnetic force acquired is a maximum in relation to the forces which can be given to the same needle or bar by the subsequent reversals of its poles.

2. The magnetic force which a needle can acquire becomes weaker in proportion as the reversal of its poles, has been multiplied. The series of frictions which tend to bring back the poles to their primitive state are more efficacious than the others.

3. This difference between the forces which the needle acquires after the successive reversal of its poles, goes on continually diminishing, and converges towards a limit. It depends in general on the size of the needle in relation to that of the rubbing bars, as well as in its force of coercion.

4. A needle cannot receive all the magnetic force which it can acquire, if the frictions do not take place over all its surface; this becomes particularly sensible in the reversal of the poles.

5. The rubbing bars give (*cæteris paribus*) to bars of the same dimensions as themselves a magnetic force equal to that which they possess, and in bars of different dimensions the forces acquired are as the cubes of their homologous dimensions. The last part of this proposition was long ago established by Coulomb.

6. When we rub magnetic bars with other bars weaker than themselves, the force of the first diminishes in place of increasing; and it appears that the force becomes that which those latter bars would be capable of giving at the first by directly magnetising them.

7. The relation which exists between the forces which a needle or a bar receives by successive frictions, and the number of these frictions, may be expressed by an exponential formula of three constants.

One of these constants appears to change its value with the size of the bars which are magnetised, at least while these bars have a magnitude which does not exceed that of the rubbing bars, and while they are of the same quality of steel.

In this way we know beforehand the successive degrees of force which a bar takes at each friction, if we have previously determined the law of these augmentations for the same rubbing bars, and for any other bar which we get to serve as the modulus. If the bar which is rubbed has begun to be magnetised, we must calculate first the number of frictions to which this force corresponds, in order to be able to assign the rank of the subsequent frictions, and the magnitude of the corresponding magnetical forces.

8. When the rubbing bars are greater than the bar to be magnetised, from the first complete friction the force of magnetism is very nearly one half of the force which the magnetised bar will finally possess.

After the twelfth complete friction, the magnetic force differs little from that which the rubbing bars can communicate.

We owe also to M. Quetelet two interesting memoirs on the magnetic intensity of different places in Switzerland, Italy, Germany, and the Low Countries.

Magnetic influence of the aurora borealis.

The influence of the aurora borealis on the magnetic needle, which was observed by Hiorter at Upsal in 1741, and by Wargentin in 1750, had long induced philosophers to regard it as a magnetic phenomenon; and this was greatly confirmed by the fact that the south end of the dipping needle points to that part of the heavens to which the rays of the aurora appear to converge. "The aurora borealis," says Dr Robison, "is observed in Europe to disturb the needle exceedingly, sometimes drawing it several degrees from its position. It is always observed to increase its deviation from the meridian, that is, an aurora borealis makes the needle point more westerly. This disturbance sometimes amounts to six or seven degrees, and is generally observed to be greatest when the aurora borealis is most remarkable.

Robison.

"This is a very curious phenomenon, and we have not been able to find any connection between this meteor and the position of a magnetic needle. It is to be observed, that a needle of copper or wood, or any substance besides iron, is not affected. We long thought it an electric phenomenon, and that the needle was affected as any other body balanced in the same manner would be; but a copper needle would then be affected. Indeed, it may still be doubted whether the aurora borealis be an electric phenomenon. They are very frequent and remarkable in Sweden, and yet Bergman says that he never observed any electric symptoms about them, though in the mean time the magnetic needle was greatly affected.

"We see the needle frequently disturbed, both from its general annual position, and from the change made on it by the diurnal variations. This is probably the effect of auroræ boreales which are invisible, either on account of thick weather or daylight. Van Swinden says he seldom or never failed to observe auroræ boreales immediately after any anomalous motion of the needle; and concluded that there had been one at the time, though he could not see it. Since no needle but a magnetic one is affected by the aurora borealis, we may conclude that there is some natural connection between this meteor and magnetism. This should farther incite us to observe the circumstance formerly mentioned, viz. that the south end of the dipping needle points to that part of the heavens where the rays of the aurora appear to converge. We wish that this were diligently observed in places which have very different variations and dips of the mariner's needle."

Van Swinden.

Dr Dalton.

A valuable series of observations on the influence of the aurora borealis on the magnetic needle was made by Dr

Dalton, at Kendal and Keswick, during seven years from May 1786 to May 1793, and has been published in his Meteorological Observations and Essays, which appeared in 1793. During these observations he noticed the effect which they produced on the magnetic needle, and he was thus led to study the phenomena of the aurora, and to establish beyond a doubt the relation of all its phenomena to the magnetic poles and equator. His views and speculations on this subject we shall detail at some length in a future part of this article; but we shall at present give our readers a specimen of the observations which he made on the magnetic needle during the changes of an aurora.

Feb. 12. The aurora appeared at Kendal after 6h. P. M. flaming over two thirds of the hemisphere. The beams converged to a point in the magnetic meridian, about 15° or 20° to the south of the zenith. The following were the changes which he observed in the needle and in the aurora:—

Time. *h.*	*m.*	Variation. °	′	Observations.
5	0 P. M.	25°	5′	west.
6	35	24	49	altitude of the clear space south 35°.
6	42	24	55	altitude of ditto 20°, streamers bright, east.
6	50	25	0	streamers bright and active all over the illuminated part.
7	2	25	28	
7	5	25	12	
7	10	24	40	disappeared in the west, active east.
7	20	24	35	active about the zenith, light faint.
7	35	24	45	light faint.
8	0	24	45	strong light northward.
8	10	24	45	a large uniform still light covering half the hemisphere, with flashes now and then.
8	35	24	47	
9	15	24	43	streamers north-west, bright east; clouds.
9	20	24	43	the aurora bursting out openly.
9	30	24	50	as fine and large a display of streamers as has appeared this evening.
10	0	24	55	
10	15	24	57	the light growing fainter and fainter.
10	35	24	40	

In these observations, the deviation produced by the aurora was 53′. In some cases during the prevalence of auroras Dr Dalton did not observe any perceptible disturbance of the needle.

Professor Hansteen observes, that large extraordinary movements of the needle, in which it traverses frequently with a shivering motion an arc of several degrees on both sides of its usual position, are seldom, perhaps never, exhibited, unless when the aurora borealis is visible; and that this disturbance of the needle seems to operate at the same time in places the most widely separate. "The extent of such extraordinary movements," he adds, "may, in less than twenty-four hours, amount to 5° or $5\frac{1}{2}$°. In most cases, the disturbance is also communicated to the dipping needle; and so soon as the crown of the aurora quits the usual place (the points where the dipping needle produced would meet the sky), the instrument moves several degrees forward, and seems to follow it. After such disorders, the mean variation of the needle is wont to change, and not to recover its previous magnitude till after a new and similar disturbance."

M. Arago.

From an extensive series of accurate observations made by M. Arago at Paris since 1818, the needle was almost invariably found to be affected by auroræ that were seen in Scotland; and so striking was the connection between the two classes of facts, that the existence of the aurora could be inferred from the derangements of the needle. M. Arago has likewise discovered, that, early in the morning, often ten or twelve hours before the aurora is developed in a very distant place, its appearance is announced by a particular form of the curve which exhibits the diurnal variation of the needle, that is, by the value of the morning and evening maxima of elongation. From a number of corresponding observations on the hourly declination made by M. Arago and M. Kupffer, who established at Kasan, near the eastern limit of Europe, one of Gambey's compasses, similar to that used at Paris, these philosophers were convinced that, notwithstanding a difference of longitude of above 47°, the disturbances produced upon the needle by the aurora took place at the same instant. It is a curious fact, however, and one yet unexplained, that during the frequent occurrence of the aurora at Port Bowen, Captain Foster did not observe any peculiar changes in the direction of the needle, although, from his great proximity to the magnetic pole, the diurnal change sometimes amounted to 4° or 5°; and, under such circumstances, the influence of the aurora ought to have been particularly conspicuous. Mr Christie is of opinion that the direction of the needle may be influenced by the electrical state of the clouds; and he found it to be so in a very distinct experiment which he made for the purpose. Captain Sir Everard Home had observed the same effect produced during thunder storms; and, in two instances, he found that a needle came sooner to rest during a thunder storm than it had done either previous or subsequent to it, the number of oscillations having been reduced in one case from 100 to 40, and in another from 200 to 120.

Magnetic influence of the aurora.

Captain Foster.

Captain Home.

Captain Back.

During the late journey of Captain Back to the polar regions in 1833, 1834, and 1835, he found that the needle was generally affected by the aurora; and on one occasion the deviation which it produced was 8°. "For nearly a month, however" (previous to the 7th January 1834), he remarks, "the needle had not been perceived to be affected by the aurora, which, it may be proper to observe, was always very faint, apparently high, and generally confined to one point of the heavens.[1] Captain Back repeatedly observed, that when the aurora was concentrated in individual beams, the needle was powerfully affected; but that it generally returned to its mean position when the aurora became generally diffused. On several occasions the needle was restless, and exhibited the vibrating action produced by the aurora when this motion was not visible; and Captain Back states that he could not account for this, except by supposing the invisible presence of the aurora in full day.

Mr David Lyon.

The only metals which were supposed to have a distinct and decided power, and were therefore called magnetic metals, are iron, nickel, and cobalt. Mr David Lyon[2] has lately endeavoured to show that these metals resemble one another, not only in their principal qualities, but in the numerical values of their qualities; and he adds, that whilst these three magnetic substances have the values above referred to near each other, there are no other substances in which the same values come very near or fall within those of the three magnetic substances. The values to which Mr Lyon alludes are the following:[3]

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[1] Appendix to Captain Back's *Narrative of the Arctic Land Expedition*, &c. p. 601.

[2] *London and Edinburgh Phil. Mag.* December 1834, p. 415.

[3] M. Pouillet, in his *Elémens de Physique*, tom. iii. p. 89, refers to some remarkable analogies which he has observed between the distance of the atoms of bodies and their magnetic properties.

	Specific Gravity.	Atomic Weight.	Atoms contained in a given space.
Nickel	8·27	739·51	1118
Iron	7·21	678·43	1062
Cobalt	7·8	738	1057

The preceding speculation, though ingenious, and deserving of attention, has however been overturned by some very recent observations of M. Faraday. "*Cobalt* and *chromium*," says he, "are said to be both magnetic metals. I cannot find that either of them is so, in its pure state, at any temperatures. When the property was present in specimens supposed to be pure, I have traced it to iron or nickel."[1]

Mr Faraday.

Mr Faraday has very recently published some interesting observations[2] *On the General Magnetic Relations and Characters of the Metals.* He is of opinion that all the metals are magnetic, in the same manner as iron, though not at common temperatures, or under ordinary circumstances. He does not allude to a feeble magnetism, uncertain in its existence and source, but to a distinct and decided power, such as that possessed by iron and nickel; and his impression is, that there is a certain temperature for each metal (well known in the case of iron, beneath which it is magnetic, but above which it loses all power), and that there is some relation between this *point* of temperature and the *intensity* of magnetic force, which the body, when reduced beneath it, can acquire. Iron and nickel would then be no more exceptions from the metals in regard to magnetism, than mercury is in regard to liquefaction.

In order to investigate this point, Mr Faraday subjected various metals in their pure state to a temperature from 60° to 70° below the zero of Fahrenheit, but he could not detect in them the least indication of magnetism. The metals tried were the following:

Arsenic.
Antimony.
Bismuth.
Cadmium.
Cobalt.
Chromium.
Copper.
Gold.
Lead.
Mercury.
Palladium.
Platinum.
Silver.
Tin.
Zinc.
Plumbago.

Mr Faraday next proceeded to compare iron and nickel with respect to the points of temperature at which they ceased to be magnetic. Iron loses all magnetic properties at an orange heat, and is then to a magnet the same as a piece of copper. Mr Faraday found that the point at which nickel lost its magnetic relations was very much lower than with iron, but equally defined and distinct. If heated and then cooled, it remained unmagnetic long after it had fallen below a heat visible in the dark; and almond oil can bear and give that heat which makes nickel indifferent to a magnet, its demagnetising temperature being about 630° or 640° Fahr. In order to determine what relation the temperature which took from a magnet its power over soft iron had to that which would take from soft iron or steel its power relative to a magnet, Mr Faraday gradually raised the temperature of a magnet, and found that it lost its polarity rather suddenly when scarcely at the boiling point of almond oil, and then acted with a magnet as cold soft iron. It required to be raised to a full orange heat before it lost its power as soft iron. "Hence he concludes, the force of the steel to *retain* that condition of its particles which renders it a permanent magnet, gives way to heat at a far lower temperature than that which is necessary to prevent its particles assuming the *same state* by the inductive action of a neighbouring magnet. Hence, at one temperature, its particles can of themselves retain a permanent state; whilst, at a higher temperature, that state, though it can be induced from without, will continue only as long as the inductive action lasts, and at a still higher temperature all capability of assuming this condition is lost. The temperature at which polarity was destroyed appeared to vary with the hardness and condition of the steel. Fragments of loadstone of very high power were then experimented with. These preserved their polarity at higher temperatures than the steel magnet; the heat of boiling oil was not sufficient to injure it. Just below visible ignition in the dark they lost their polarity, but from that to a temperature a little higher, being very dull ignition, they acted as soft iron would do, and then suddenly lost that power also. Thus the loadstone retained its polarity longer than the steel magnet, but lost its capability of becoming a magnet by induction much sooner. When magnetic polarity was given to it with a magnet, it retained this power up to the same degree of temperature as that at which it held its first and natural magnetism."

M. Pouillet.

Some of the results observed by M. Pouillet[3] stand in opposition to some of the preceding statements. M. Pouillet considers it as certain that there are *five* simple magnetic bodies, viz.

Iron,
Manganese,
Nickel,
Chrome, and
Cobalt;

and in consequence of having observed some remarkable analogies between the distance of the atoms of bodies and their magnetic properties, he was led to suppose that the magnetic limit of different bodies ought to be found at very different temperatures. "I have indeed," says he, "demonstrated by experiment, 1. that cobalt never ceases to be magnetic, or rather that its magnetic limit is at a temperature higher than the brightest white heat; 2. that chrome has its magnetic limit a little below the temperature of dark blood-red heat; 3. that nickel has its magnetic limit about 350° centigrade nearly at the melting point of zinc; and, 4. that manganese has its magnetic limit *at the temperature of from 20° to 25° below zero.*[4] Experiments," continues he, "on these five magnetic bodies seem to prove, 1*st*, that heat acts upon magnetism only in consequence of the greater or less distance which it occasions between the atoms of bodies; and, 2*d*, that all bodies would become magnetic if we could by any action whatever make their atoms approach within a suitable distance."

Professor Gauss. A. D. 1833.

Among the latest researches on magnetism are those of Professor Gauss of Göttingen, who has published an account of them in a treatise entitled *Intensitas vis Magneticæ Terrestris ad absolutam mensuram revocatis.* His object is to impart to magnetical observations the accuracy of astronomical ones. By observing the oscillations of a magnetised bar, he finds the product of the horizontal intensity of the earth's magnetism, and the static momentum of the free magnetism of the bar; and by eliminating the latter from the two equations, he obtains an absolute measure of the former, independent of the magnetism of the bar. The horizontal intensity thus found is then to be multiplied by the secant of the dip of the needle, in order to give the absolute intensity. In this inquiry Professor Gauss found it necessary to deduce from observation the true law of magnetic action, which, from a number of consistent and carefully made experiments, he found to be in the inverse ratio of the square of the distance. From a series of accurate experiments,

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[1] *London and Edinburgh Phil. Mag.* March 1836, p. 178.

[2] *Ibid.* p. 177.

[3] *Elémens de Physique*, 2d. edit. tom. iii. p. 89, Paris, 1832.

[4] M. Pouillet remarks elsewhere, that manganese does not become magnetic till it is cooled down to 15° or 20° below zero. (*El. Phys.* iii. p. 18.)

Professor Gauss found the horizontal intensity at Göttingen, on the 18th September 1832, to be 1·7821; and taking the exponent of gravity in moving bodies at the place of observation as the unit of force, and using the Paris line and the Berlin pound, he found the absolute horizontal intensity to be 0·0039131; and as he found the dip at Göttingen on the 23d June 1832 to be 68° 22′ 52″, the absolute intensity of terrestrial magnetism will be

$$\text{Sec. } 68^\circ\ 22'\ 52'' \times 0{\cdot}0039131.$$

Professor Gauss has proposed, and put in practice, a very accurate method of observing the daily variation of the needle, and of determining the time of vibration of a needle or magnetised bar. He fixes a plane mirror on the end of the bar, and perpendicularly to its axis, and by observing the reflected image of the divisions of a scale, by the aid of a theodolite placed at a distance, he is able to observe and to measure the minutest changes.

The magnetised bar employed by Gauss is of much larger dimensions than the bar of Prony's magnetic telescope; the small ones, which he uses as magnetometers, being four pounds weight, and the large ones twenty-five pounds; two of which, when fastened together, form the *apparatus or multiplier* of induction for rendering sensible and measuring the oscillatory movements predicted by a theory founded on Mr Faraday's great discovery. By this valuable invention of Professor Gauss, the observer is not under the necessity of approaching the magnetised bar, so that no disturbance is occasioned by the currents of air produced by the proximity of the observer's body, so that observations may be made in the smallest intervals of time.

With apparatus similar to that of Professor Gauss, simultaneous observations have been made in 1834 and 1836, at intervals of five or ten minutes, at Göttingen, Copenhagen, Altona, Brunswick, Leipsig, Berlin, Milan, and Rome. It appears, from the graphic representation of the results, that the smallest inflexions of the horary curves are parallel, and consequently the disturbing causes which produce them simultaneous at Milan and Copenhagen, two of the places of observation, which have a difference of latitude of 10° 13′.

In giving an account of Professor Hansteen's labours, we have briefly noticed his journey in Siberia, and the erection of magnetic observatories by the emperor of Russia, on the recommendation of Baron Humboldt; and we have also referred to the early researches of this distinguished philosopher. When travelling in the equinoctial regions of America during the years 1799–1804, Baron Humboldt had devoted much attention to the determination of the intensity of the magnetic forces, and of the dip and variation of the needle. Upon his arrival in Europe, he conceived the design of examining the progress of the horary changes of the variation, and the perturbations to which it is subject, by employing a method which had never been adopted on an extended scale. In a large garden at Berlin, he measured, particularly at the period of the equinoxes in 1806 and 1807, the angular alterations of the magnetic meridian, at intervals of an hour, often of half an hour, without interruption, during four, five, or six days, and as many nights. The instrument employed was Prony's magnetic telescope, suspended according to the method of Coulomb, and capable of being reversed upon its axis. It was placed in a glass frame, and directed towards a very distant meridian mark, the illuminated divisions of which indicated six or seven seconds of hourly variation. In these researches Baron Humboldt was struck with the frequency of oscillations whose amplitude extended beyond all the divisions of the scale, and which repeatedly took place at the same hours before sunrise. "These vagaries of the needle," says the baron, "the almost periodical return of which has recently been confirmed by M. Kupffer, in the account of his travels in the Caucasus, appeared to me the effect of a re-action of the interior of the earth towards the surface; I should venture to say, of *magnetic storms*, which indicate a rapid change of tension." With the view of investigating the causes of these disturbances, Baron Humboldt proposed to erect similar apparatus on both sides of the meridian of Berlin; but the political tempest of Germany, and his mission to France by the government, delayed the execution of his plan. M. Arago, however, as we have already seen, began and prosecuted his inquiry with singular success.

General Properties of Magnetic Bodies.

Baron Humboldt.

When Baron Humboldt again fixed his residence in Germany in 1827, he erected one of Gambey's compasses in a magnetic pavilion, without any iron, in the middle of a garden, and began a series of regular observations in the autumn of 1828. At his request, the Imperial Academy and the curator of the university of Kasan erected magnetic observatories at St Petersburg and Kasan; and the imperial department for mines has established similar stations at Moscow, Barnaoul, and Nertschinsk. The academy, too, has sent Mr George Fuss to Pekin, where he has procured the erection of a magnetic pavilion in the convent garden of the monks of the Greek church. Since Mr G. Fuss's return, M. Kowanko, a young officer of mines, continues the horary observations corresponding to those made in Germany and Russia. Admiral Greig has established one of Gambey's compasses in the Crimea at Nicolaeff. Baron Humboldt has procured the establishment of a magnetic apparatus at the depth of thirty-five fathoms, in an adit in the mines of Freiberg in Saxony. Baron Von Wrangel has been provided with one of Gambey's compasses at Sitka, in one of the Russian settlements. M. Arago has caused to be erected, at his own expense, one of Gambey's compasses in the interior of Mexico, where the soil is 6000 feet above the sea. The French minister of marine has established a magnetic station in Iceland, and the necessary instruments will be sent this summer (1836) to Reikavig; and Baron Humboldt, at the desire of Admiral de Laborde, has sent instruments to the Havannah in Cuba, to furnish a magnetic observatory under the tropic of Cancer.

Some years ago, the writer of this article urged a distinguished and influential member of the British government to establish magnetic observatories in England and the colonies, but no steps were taken in consequence of this application. Baron Humboldt has, however, addressed an interesting letter to his Royal Highness the Duke of Sussex, as president of the Royal Society, soliciting this body to extend, in the colonies of Great Britain, the line of simultaneous observations, and to establish permanent magnetic stations, either in the tropical regions on each side of the magnetic equator, or in the high latitudes of the southern hemisphere, and in Canada. We hope that the Royal Society will use its influence with the British government to have this proposal carried into effect, and that this country shall not be exposed to the humiliation of being indifferent to the progress of those branches of scientific inquiry which its extensive influence in various regions of the globe enables it effectually to advance.

CHAP. II.—ON THE GENERAL PHENOMENA AND PROPERTIES OF MAGNETIC BODIES.

General properties of magnetic bodies.

A body is said to be magnetic when it has the power of attracting soft iron, either in the subdivided state of iron filings, or in large portions; or of attracting and repelling other magnetic bodies like itself: of taking a particular position when freely suspended, or moving on a pivot: and of communicating magnetism either temporarily to soft or permanently to hard iron in the form of steel. Hence we may arrange the general properties of magnetic bodies under the following heads.

General Properties of Magnetic Bodies.

1. On the attractive power of magnetic bodies upon soft iron.

2. On the attractive and repulsive power of magnets over each other, or over iron either temporarily or permanently magnetised.

3. On the effect of masses of iron on the attractive force of a magnet.

4. On the polarity of magnetic bodies.

5. On the power of magnets to communicate magnetism to other bodies.

6. On the distribution of magnetism in artificial magnets.

7. On the effect of division and fracture on the distribution of magnetism.

8. On magnetic figures.

SECT. I.—*On the Attractive Power of Magnetic Bodies upon Soft Iron.*

Attraction of magnets over iron.

The natural magnet or loadstone was for a long time the only body considered as possessing magnetic properties. It is an ore of iron, of a grey colour, and a dark metallic lustre. Its specific gravity is about four and a half times that of water. It crystallizes in the form of the regular octahedron, and it consists of from 85 to 75 parts of iron, and from 15 to 25 parts of oxygen. It is found in almost every part of the world,[1] and often forms rocks of considerable magnitude; but different specimens of it possess very different powers of attraction.

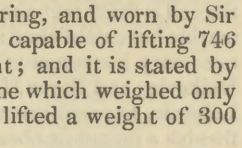
Loadstone.

The smallest loadstones generally have a greater attractive power in proportion to their size than larger ones. They have been found of such strength, that though weighing only about twenty-five grains, they could lift a piece of iron about forty-five times heavier than themselves. A small magnet set in a ring, and worn by Sir Isaac Newton, is said to have been capable of lifting 746 grains, or 250 times its own weight; and it is stated by Cavallo, that he has seen a loadstone which weighed only about six and a half grains, which lifted a weight of 300 grains.

Natural loadstones often possess unequal powers of attraction in different parts of their mass, in consequence of want of homogeneity of structure and composition; and hence a portion has often been cut from a large loadstone which could lift a greater weight of iron than the large one itself, the portion detached having possessed the most suitable structure, and the other part having weakened the action of the powerful part by keeping the body to be lifted at a greater distance from those points where the magnetism was strongest. It is no doubt from a similar cause that small magnets have a greater proportional power than large ones, or that those of two pounds weight have seldom been found capable of lifting more than *ten* times their own weight of iron.

If we now take a natural loadstone L, however shapeless, and, after rolling it in a quantity of iron filings, afterwards withdraw it, we shall find that the filings are accumulated more abundantly in two opposite points A, B, than in any other, as shown in fig. 1. These two points A, B are called the poles of the magnet, and are the points of greatest attraction. When either of these poles is held at a distance from the iron filings, the filings will be attracted to it, and will adhere with such force that it is difficult to brush them off.

Fig. 1.



If we suspend a small needle of iron or steel by a fine linen or silken fibre, or balance it on a pivot, and bring the poles of the loadstone L near it, it will be attracted to it in the first case, or will oscillate on its pivot in the second case.

If we make the needle float on water in a glass tumbler, and bring any pole of L on the outside of the tumbler, the needle will be attracted towards the pole, notwithstanding the interposition of the glass; and by using the needle upon a pivot, it will be found that the attractive force of the loadstone is in no respect diminished by the interposition of any substance whatever, except iron, conductors and non-conductors of electricity having no effect whatever in stopping or diminishing the action of the loadstone, unless the interposed body be iron, or contains iron in any of its metallic states.

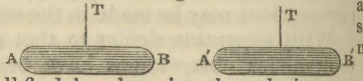
While the loadstone thus attracts iron, and all bodies containing it in a metallic state, these same bodies exercise a reciprocal attraction upon the loadstone, action and re-action being equal and opposite. The truth of this may be exhibited by suspending a magnet, and bringing into the vicinity of its poles a piece of soft iron. The magnet will be gradually attracted by the iron, in the same manner as if the iron had been suspended and a pole of the magnet held near it.

SECT. II.—*On the Attractive and Repulsive Power of Magnets over each other, or over Iron either temporarily or permanently magnetised.*

Attraction and repulsion of magnets.

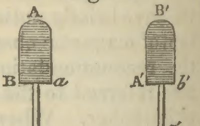
If we suspend near each other two loadstones, AB, A′B′, like that shown in fig. 1, by two threads T, T, we shall find, by changing the relative position of their poles, A B, A′ B′, that there are certain positions in which these poles attract each other, and others in which they are repelled. By marking the poles which attract each other, such as A, B′ and A′, B, we shall find that the poles which repel each other are A, A′ and B, B′, and that this mutual attraction and repulsion takes place under every change of circumstances.

Fig. 2.



If we suspend a piece of soft iron *ab* from a loadstone AB, we shall find that the end *b* of the iron exercises the same attractive and repulsive power upon the poles A′ B′ (fig. 2) of a suspended magnet that B did; and in like manner, if the piece of iron *a′b′* is suspended from the pole A′, the end *a′* will exercise the same attraction and repulsion upon the poles of a suspended magnet that A did.

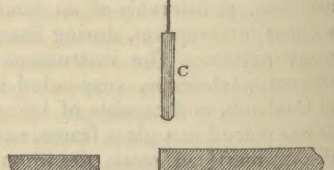
Fig. 3.



SECT. III.—*On the effect of Masses of Iron on the Attractive Force of a Magnet.*

Effect of masses of iron on the attractive force.

Fig. 4.



If we suspend a piece of iron C from the arm of a balance, it will be attracted by the pole P of a magnet A, and will descend towards P in virtue of this attraction. If we now place a mass of iron I close to A, the suspended iron C will rise, as if the attractive force of P were diminished. This power of the mass of iron I seems only to extend to a given point within the magnet A, the distance between the magnet and the iron remaining the same;

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[1] According to Norman, the best loadstones were those brought from China and Bengal.

for if the iron C is suspended above a point x at some distance from P, the action of I will not be felt at the point x, except by diminishing the distance between P and C, or by increasing the neutralising power of the mass I.

Mr Snow Harris, to whom we owe this experiment, has shown that a similar effect is produced when the iron I is placed between the magnet PA and the suspended iron C, and also when I is placed below P. In the first of these cases I stops the attraction of P upon C, and acts as a screen.

SECT. IV.—*On the Polarity of Magnetic Bodies.*

If we suspend a loadstone, as in fig. 2, or make it float upon water or mercury, by placing it on a thin plate of cork or wood, it will gradually change its place till it rests in a position where a line joining the poles A, B is nearly north and south. This is, generally speaking, the case in Europe, the end A, which points northward, deviating in some places from the meridian to the west, in some places to the east; while in other parts of the globe it points exactly to the north. The deviation of the loadstone from the meridian is called its *declination* or *variation*. This property of the magnet is called its *polarity*, or *directive power;* and the pole A, which turns to the north, is called its *north pole;* and the pole B, which turns to the south, its *south pole*. It will now be found that the poles and magnets A, A′, or B, B′, which repel each other, are either both *north* or both *south* poles; and that the north and south poles attract each other. Hence there is in magnetism, as there is in electricity, two opposite powers or principles, namely, the *northern* and the *southern*, or boreal and austral magnetism; and, as in electricity, a *repulsion* takes place between the two powers of the *same* name, and *attraction* between the two powers of an *opposite* name.

The magnetism from which loadstones derive their polarity, or their tendency to direct themselves to particular points of the compass, is obviously derived in some way or other from the earth or its atmosphere; and hence it is called the *Magnetism of the Earth*, or *Terrestrial Magnetism*, which will be treated more fully in a future part of this article.

SECT. V.—*On the Power of Magnets to communicate Magnetism to other Bodies.*

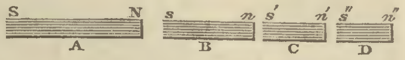
We have already seen, that if a piece of soft iron is suspended to a magnet by the attraction of one of its poles, the iron becomes magnetic, but only during the time that it is in contact with the loadstone. But if we use a piece of hardened iron, or steel, $a\ b$, and suspend it as in fig. 3, it will be found to have acquired a permanent magnetism, the strength of which will depend on the power of the natural magnet A B, and on the time which the steel bar has been suspended. The pole a will be a *north* pole similar to A, and the pole b a *south* pole similar to B; and the little magnet $a\ b$ will possess all the properties of the natural magnet, such as attraction for soft iron, and polarity; and its action upon another little steel magnet $a'\ b'$, made in a similar manner, will be the same as the action of two natural magnets upon each other. A steel magnet thus made is called an *artificial magnet;* and we shall in the sequel consider the magnets of which we speak as steel bars rendered permanently magnetic.

A little magnet $a\ b$ has been made by a very simple process, namely, that of contact with the pole of a natural magnet; but there are more complex and efficacious methods, by which a very high degree of permanent magnetism can be communicated to steel, which will be fully explained in the practical part of this treatise.

In order to communicate magnetism from a natural or artificial magnet to unmagnetised iron or steel, it is not necessary that the two bodies be in contact. The communication is effected as perfectly, though more feebly, when the bodies are separated by space.

Magnetic induction.

Fig. 5.

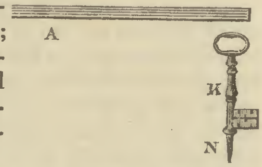


If the *north* pole N of an artificial steel magnet A is placed near the extremity s of a piece of soft iron B, the end s will instantly acquire the properties of a *south* pole, and the opposite end n those of a *north* pole. The opposite poles would have been produced at n and s if the south pole S of the magnet A had been placed near the iron B.

In like manner, the iron B, though only temporarily magnetic, will render another piece of iron C, and this again another piece D, temporarily magnetic, north and south poles being produced at n', s', and n'' s''.

The magnetism inherent in B, C, and D, is said to be *induced* by the presence of the real magnet A, and the phenomena are exactly analogous to the communication of electricity to unelectrified bodies by induction, the positive state inducing the negative, and the negative the positive, in the parts of a conductor placed in a state of insulation near an electrified body.

Fig. 6.



In order to show by simple experiments that soft iron is itself a magnet while placed near a magnet, let A be a magnet, and K a key held near its lower edge. A nail N will remain suspended by virtue of its induced magnetism; but if A is withdrawn, or K removed from A, the nail N will instantly fall, the induced magnetism diminishing with the distance.

If we hold the key K above a portion of iron filings, they will not be attracted by it; but if we then bring the magnet A near the ring of the key, as in the figure, the iron filings will instantly start up, and be attracted by the key.

Re-action of iron on magnets.

We have already noticed, in Sect. I., that the iron attracted by a magnet re-acts upon the magnet, and attracts it in return. The same is the case with a bar of iron on which magnetism is induced. It re-acts on the magnet which induces its magnetism, and increases its magnetic intensity. Hence we derive a distinct explanation of the remarkable facts, that a magnet has its power increased by having a bar of iron placed in contact with one of its poles, and that we can gradually add more weight to that which is carried by a magnet, provided we make the addition slowly and in small quantities, the power of the magnet being increased by the re-action of each separate piece of iron that it is made to carry.

Consecutive poles.

If the bar of iron on which magnetism is induced is long, and the strength of the magnet great, a succession of poles is produced along its length, a north pole always following a south pole, and *vice versa*.

Magnetic attraction and repulsion explained.

These facts enable us to explain the phenomena of magnetic attraction and repulsion, which are necessary consequences of magnetic induction. The magnet attracts a piece of iron by inducing an opposite polarity at the end in contact with it, and the two opposite principles attract each other. In like manner, the north pole of one magnet attracts the south pole of another, and the north and south poles repel each other, in consequence of the attraction and repulsion of the opposite or similar principles. The attraction of iron filings is explained in the same manner. The particle of iron next the magnet has magnetism induced upon it, and it becomes a minute magnet, like B in fig. 5. This particle again makes the next particle a magnet, like C, and so on, the opposite polarities in each particle of the filings attracting one another, as if they were real magnets.

In comparing the amount of the *attractive* force of two *dissimilar* poles of two magnets, with the amount of the *repulsive* force of the two similar poles, it has been found that the former force is considerably greater than the latter. This result is a necessary consequence of the inductive process above described. When the two attracting poles are in contact, each magnet tends to increase the power of the other, by developing the opposite magnetisms in the adjacent halves, and thus increasing their mutual attraction. But when the two repelling poles are brought into contact, the action of each half brought into contact has a tendency to develope in that half a magnetism opposite to that which it really possesses, and thus to diminish the two similar principles, and weaken their repulsive power. This injurious influence of opposite poles upon the repulsive power of the magnets in action, is finely exhibited when one of the magnets is very powerful, and the other very weak. When the two similar poles are held at a moderate distance, a repulsion is distinctly exhibited; but when they are brought into contact, the stronger *attracts* the weaker magnet, an effect which is produced by its actually destroying the similar weak magnetism in the half next it, and inducing in that half the opposite magnetism, which, of course, occasions attraction.

When the magnet A and the piece of iron B are placed in the same straight line, as in fig. 5, the pole N acts favourably in inducing south polar magnetism at *n*, and north polar at *s*; but it is evident that the remote pole S must tend to weaken the inductive force of N, by inducing, though in a feeble degree, north polar magnetism at *n* and south polar at *s*. If the soft iron B is placed as in fig. 7, the induced magnetism will be nearly as strong as before, the greater proximity of N tending to produce south polar magnetism in *n*, being compensated by the increased proximity of S tending to produce north polar magnetism in *n*. In the inclined position C the induced magnetism is still stronger, as S acts more powerfully upon *n*; and when the two are parallel, as in fig. 8, the two bars or magnets are in the position most favourable for developing and sustaining the magnetism which they receive or possess.

Fig. 7.

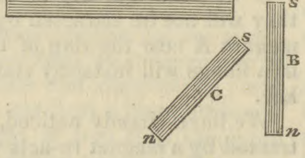
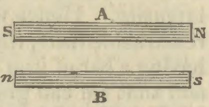


Fig. 8.



Hitherto we have considered the natural and artificial magnet as producing magnetism in soft or hard iron, distributed in the same manner as in the inducing magnet; but by the action of one or more magnets, we can distribute the magnetism in various ways, as follows:

In the case of bars, we may have a north pole in the middle of it, and a south pole at each extremity. Thus, in fig. 9, if the magnet NS has its north pole N placed opposite the middle of the soft iron bar *nn*, this bar will have a south pole at *s* and north poles at *n*, *n*. The very same effect will be produced if, as in fig. 10, we place the soft iron bar B between two magnets A, C, whose north poles N, N are nearest the bar. These north poles N, N tend to produce south poles at *s*, *s*, and consequently northern polarity in the middle at *n*. In the preceding case a south pole may be produced in the middle, and north poles at the ends of the bar, by placing the south poles of the magnets where the north poles are placed.

Fig. 9.

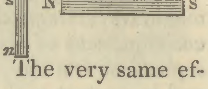
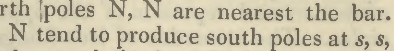
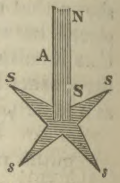


Fig. 10.



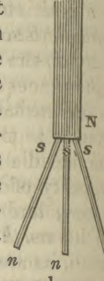
In like manner, a piece of soft iron *s s*, *s s*, of the form of a cross, will have south poles at *s*, *s*, *s*, *s*, if the south pole S of a magnet A is placed on or near its centre, as in fig. 11, as it may be conceived to consist of two bars *s s*, *s s*. For the same reason, if a circular plate of soft iron is substituted in place of the cross *ss*, *ss*, and the south pole S of the magnet placed upon or near its centre, that centre will be a north pole, and every point of the circumference of the plate will be a south pole.

Fig. 11.



A very instructive experiment, founded on magnetic induction, is exhibited in fig. 12, where several soft iron wires or slender bars *sn*, *sn*, *sn* are suspended at the north pole N of a magnet N. Each of the ends *s*, *s*, *s* becomes a south pole by induction from the action of the north, and consequently the lower ends *n*, *n*, *n* north poles. The south poles *s*, *s*, *s* have a tendency to repel each other, but are prevented from yielding to their repulsive forces in consequence of their strong adhesion to the north pole N. The north poles *n*, *n*, *n*, however, are free from this restraint, and exhibit their mutual repulsion by their diverging, as shown in the figure. Hence we see the reason why rows of iron filings adhering to each other, when attracted by a magnet, keep separate from each other by the repulsive forces of the similar poles.

Fig. 12.



In the following form of the experiment given by Cavallo, the repulsion of both poles is well illustrated. If we suspend two short pieces of soft iron wire *ns*, *ns* by threads, they will hang in contact in a vertical position. If we now bring the north pole N of a magnet A to a moderate distance from the wires, they will recede from each other, as in fig. 13. The ends *s*, *s*, being made south poles by induction from the north pole N, will repel each other, and so will the north poles *n*, *n*. This separation of the wires will increase as the magnet A approaches nearer them; but there will be a particular distance at which the attractive force of N overcomes the repulsive force of the poles *s*, *s*, and causes the wires to converge, as in fig. 14, the north poles *n*, *n* still exhibiting their mutual repulsion.

Fig. 13.

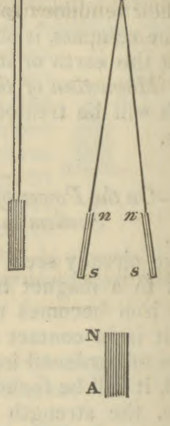
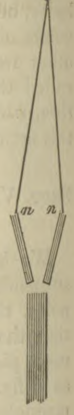
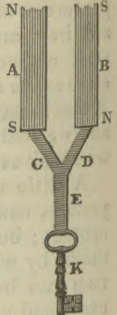


Fig. 14.



The neutralisation or destruction of induced magnetism, by two equal and opposite magnetic actions, is shown in the following experiment, given by Dr Robison. If we take a forked piece of soft iron CDE, and suspend it by the branch D from the north pole of a magnet B, it will be magnetised by induction, and will carry a key at its lower end E, which will be a north pole. If we now apply to the other branch C the south pole S of another and equal magnet A, the key will instantly drop off. This obviously arises from the south pole S inducing a south pole at E, which either destroys or neutralizes the north polar magnetism previously induced by N.

Fig. 15.



SECT. VI.—*On the Distribution of Magnetism in Artificial Magnets.*

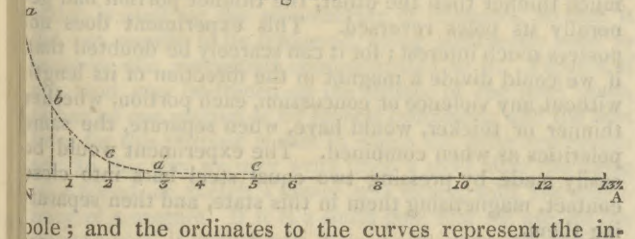
It is very obvious, from the preceding experiments, that in regular magnets, with a north pole at one end and a south pole at the other, the two kinds of magnetism, north polar and south polar, are equally and regularly distributed, the one occupying one half of the magnet, and the other the other half. It is obvious also that each kind of magnetism has no intensity at the centre of the magnet, or its middle part, and that it increases, according to some regular law, from that point towards the two poles at the extremities of the magnet.

The first person who determined the law of distribution which we have now mentioned was M. Coulomb. The magnet which he employed for this purpose was a cylinder two lines in diameter, twenty-seven inches long, and its weight 1946 grains; and he ascertained the intensity of magnetism at each point, from its middle to its extremity, by observing the number of oscillations which a small magnetic needle performed in a minute, when it was made to oscillate before different points of the wire. He had previously observed the number of oscillations which the same needle performed out of the sphere of the magnet, and he considered the magnetic intensity as proportional to the difference of the squares of those two numbers of oscillations. The first needle which he employed was three lines in diameter and six lines long, and it was made of such a size, and of such hardness, that its magnetism should not be perceptibly altered by the action of the wire during the experiments; for if any change did take place, the results obtained at different points of the magnet could not be compared. The great length of twenty-seven inches was given to the magnet, in order that its remoter pole might be so distant from the needle that it would be unnecessary to make any allowance for its action upon the oscillations of the needle. In this way Coulomb obtained the following results:—

Distances from the North Pole of the Magnet.	Observed Intensity of the Magnetism at these distances.
0	165
1	90
2	48
3	23
4, 5	9
6	6

The distribution of the magnetism is exhibited in fig. 16, where AN is half of the magnet, and N its north pole; and the ordinates to the curves represent the intensities in the preceding table.

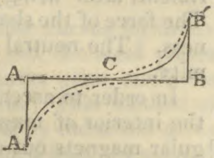
Fig. 16.



These experiments were repeated by Coulomb, with magnets of the same shape and diameter, but of a less length, all other circumstances being unchanged, and he obtained nearly the same results for the three inches of the magnet nearest N; and hence he concluded, that whatever was the length of the magnet, provided it was greater than six or seven inches, the three inches at both its north and south poles gave always the same results as the twenty-seven inch magnet. From this point towards the centre the magnetism became weak and insensible in all of them; and in very long magnets he even found that the ordinates sometimes passed from positive to negative.

M. Biot has remarked that the curve of intensity, as determined by Coulomb, results from the combination of two logarithmic curves ACB′, A′CB, which, setting out from each pole A, B of the magnet AB, would have their ordinates equal and in an opposite direction, as shown in fig. 17. The intensities calculated upon this supposition agree exactly with the observed results.

Fig. 17.



Becquerel's experiments.

As Coulomb had examined the distribution of magnetism only in magnets of considerable size, M. Becquerel[1] was desirous of ascertaining if the law was observed in steel wires of a small diameter, such as $\frac{1}{80}$th of a millimetre, or $\frac{1}{2000}$th of an inch. In order to procure such wires, he encased a steel wire one millimetre in diameter in a cylinder of silver, and having drawn out the whole into a wire, the silver was removed by means of boiling mercury. He employed the method used by Coulomb in determining the law of distribution; but, on account of the fineness of the wires, and the weakness of the magnetism which they acquired, he was obliged to make some changes in the method. He obtained, however, the very same results as those given by Coulomb.

Kupffer's experiments.

A number of interesting experiments on the distribution of magnetism have been made by M. Kupffer of Kasan,[2] by means of the method of Coulomb. He employed a flat and very narrow needle, twelve millimetres long, and he placed it at a horizontal distance of three decimetres from a cylindrical bar magnet of cast steel not tempered, 607 millimetres long and 12½ millimetres thick. He began his experiments with magnets that possess a weak degree of magnetism. In magnetising them, he rubbed the steel bar perpendicularly on the *north* pole of a very strong artificial magnet, and he replaced the bar vertically before the needle, the north pole of the former being uppermost. He found that the south pole was stronger than the north pole, and that the point of indifference, or the neutral point, was nearer the stronger pole than the other. Upon reversing the magnet, the magnetic intensities of its different points increased, and the neutral point approached the middle of the magnet. These changes were produced successively, and the magnet did not attain its final state till it had remained some time in the same position. Kupffer observed, that whenever the magnetic intensities of the bar increased, the neutral point slowly approached the middle point; that this point was always nearer the stronger pole; that a bar magnetised vertically was always more powerful when its north pole was downwards; and that a bar magnetised by the method mentioned above was always strongest in the pole immediately produced by that of the magnet.

After detailing his observations with a bar magnetised to saturation, he proceeds to determine the influence exercised by the form of the extremities of the bar on the magnetic intensity, and on the position of the neutral point. A cylindrical bar of steel, cast but not tempered, having been rounded at one of its ends, and magnetised to saturation, was placed fourteen centimetres from a magnetic needle, and in the line of its direction. When its north pole was directed to the south, the force of the rounded north pole was 2·0319, and that of the south pole was 2·1558. In the opposite position of the bar, the magnetic force of the north pole was 2·2198, and that of the south pole 2·3006, the neutral point being in the middle.

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[1] *Ann. de Chimie*, tom. xxii. p. 115; Becquerel, *Traité Experimentale de l'Electricité et de Magnetisme*, tom. i. p. 365.

[2] *Ibid.* tom. xxvi. p. 50.

The rounded end of the bar was now filed to a point, and made sharper and sharper in every successive experiment, after being each time magnetised to saturation. The force of the sharpened pole diminished with its acuteness. The neutral point receded always from this extremity.

Distribution of magnetism in the interior of magnets. Coulomb's experiments.

In order to ascertain the distribution of magnetism in the interior of magnets, Coulomb formed sixteen rectangular magnets out of the same piece of steel. Each was six inches long, nine and a half lines wide, and 382 grains in weight. They were annealed at a white heat, without being tempered, in order that he might be certain of having them always in the same state. He magnetised them all to saturation, and formed bundles with a certain number of them, similar poles being placed together. The magnets in each bundle were bound tightly together with a strong silk thread. Each bundle was then placed in a torsion balance, and placed 30° out of the magnetic meridian. The force of torsion necessary to retain it in this position was a measure of its magnetic intensity. The following were the forces or degrees of torsion necessary to keep the different bundles at rest.

	Degrees of Torsion.
1 magnet	82°
2 magnets united	125
4 magnets united	150
6 magnets united	172
8 magnets united	182
12 magnets united	205
16 magnets united	229

Hence it follows that the magnetic force of each bundle increases in a ratio much less than that of the number of plates.

Coulomb next determined the magnetic state of each of the magnets composing the bundles of eight and sixteen magnets; and he found that the two outermost magnets, those which formed the surface of the bundles, had a much greater force than the rest.

The first had a force which measured	46
The second	48
And the mean force of all the rest was	30

A single magnet had its directing force 82°, while for sixteen of them united the mean directing force of each was only 14°·3, that is, about the sixth part of the other.

In examining the bundle of eight magnets by the method of oscillation, he found that the two outermost performed twenty oscillations in $90\frac{1}{2}$ minutes, while all the rest performed the same number in from 211 to 278 nearly, showing the weakness of their magnetism. It is curious that the outermost but one had its poles reversed.

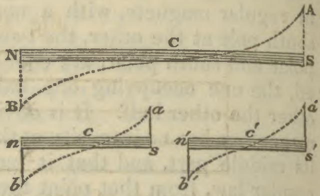
Coulomb also found that a bundle of magnets will take nearly the same degree of magnetism as a single magnet of the same shape and weight; which leads us to believe that, in magnets of one piece, the magnetism diminishes from the surface to the centre, as in the preceding bundles of magnets.

SECT. VII.—*On the Effect of Division and Fracture in the Distribution of Magnetism.*

Effects produced by breaking magnets.

As no natural or artificial magnet has ever been seen with only one pole, or one kind of magnetism, it became interesting to determine experimentally the distribution of magnetism in a part of a magnet cut from its north or south extremity. This experiment has been often made, both by cutting it through at the middle or neutral point, or by cutting or breaking off a portion from the end of it. If NS, for example, is a magnet, N its north and S its south pole, and ACB the curve representing the intensity of its magnetism; then, if we cut it through the middle C, each half *ns*, *n's'* will be a complete magnet, with a north pole at *n*, and a south one at *s*, and their neutral points at *c*, *c'*; the curves at *acb*, *a'c'b'*, representing the distribution of their north and south polar magnetism, being similar to the curve ACB of the large magnet of which they are the halves.

Fig. 18.



When Æpinus made this curious experiment, he did not divide the magnet in two, but he set two steel bars end to end, and magnetised them as one magnet, so that this compound magnet had its magnetism distributed as in a single bar, like NS, fig. 18. He then separated them, and found that each bar was a perfect magnet, with two poles. Dr Robison repeated this experiment successfully on some occasions; but he sometimes found indications of the compound magnet acting as two magnets. We are persuaded that this arose from an imperfect union of the two bars, and not from any defect in Æpinus's experiment. The united ends of the bars should be ground together, so as to be kept in perfect contact, and preserved in this state by a powerful pressure during the time that they are magnetised. If this be done, we have no doubt that they will act on iron filings, and throw them into curves, as if they were a single bar, and will, by examination with a fine needle, exhibit the same regular distribution of magnetism which takes place in the most perfect magnet.

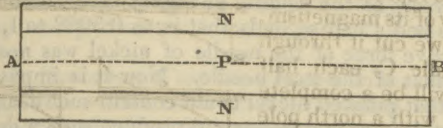
Upon the separation of the magnets thus united, Æpinus found that two poles were instantly developed in each half, but that the neutral points *c*, *c'*, fig. 18, were nearer the interior poles *s*, *n'*, or, what is the same thing, nearer the original neutral point C, than to *n* and *s'*. In the space of about a quarter of an hour it had, however, advanced nearer to the middle points *c*, *c'*, and continued for some hours, and sometimes for days, to advance to these points, which it finally reached, thus completing the regular distribution of the two opposite magnetisms.

Some observations, but not very accurate ones, have been made on the division of magnets in the direction of their lengths. According to Dr Derham, the two portions sometimes have contrary, and sometimes the same poles, as when they were united. When one portion was much thinner than the other, the thinner portion had generally its poles reversed. This experiment does not possess much interest; for it can scarcely be doubted that, if we could divide a magnet in the direction of its length without any violence or concussion, each portion, whether thinner or thicker, would have, when separate, the same polarities as when combined. The experiment would be easily made by pressing two equal steel bars into close contact, magnetising them in this state, and then separating them.

Analogy between magnets and unannealed glass.

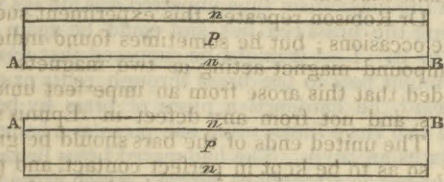
A very remarkable analogy has been pointed out by Sir David Brewster, between the preceding results and those which he has obtained with parallelopipeds of glass which received the doubly refracting structure by being quickly cooled on all their surfaces from a state of red heat. This change is analogous to that of temper in a magnet; and the effect of it is to produce a certain development of positive and negative double refraction throughout the whole of the parallelopiped of glass. These phenomena will be minutely explained in our article on OPTICS; but we may state at present, that the structure of the glass modifies the action of the ether which it contains, just as the structure of the tempered steel keeps the two magnetisms in an uncombined state. This is shown in fig. 19, where

Fig. 19.



AB is a thick plate of glass quickly cooled. The middle portion of it P has positive, and the external portions N, N, negative double refraction. The density of the ether in each of these portions varies according to a regular law; and the intensity of the doubly refracting force, at different points both of the positive and negative structures, is represented by a curve formed by the superposition of a straight line and a parabola. If we now cut the parallelopiped of glass into two halves, through the dotted line AB, fig. 19, each half will have the same structure as the whole, as shown in fig. 20; the parts that were formerly *positive* being now *negative*, and *vice versa;* and the intensity of the doubly refracting force in each half will be represented by the ordinates of a curve formed by the superposition of a straight line and a parabola. This fact is in perfect analogy with the magnetic one, and there are many other remarkable points of resemblance which we have not space to describe at present.

Fig. 20.



SECT. VIII.—*On Magnetic Figures.*

Magnetic figures.

In our article on ELECTRICITY we have given an account of the beautiful electrical figures discovered by M. Lichtenberg, and which form one of the most interesting popular experiments in that science. We are indebted to M. Haldat of Nancy for the analogous discovery of magnetic figures, which may be easily produced. For this purpose he employs plates of steel from eight to twelve inches square, and from one twentieth to one eighth of an inch thick. The plates which he used were of that kind of steel which is used for the manufacture of cuirasses, so that it did not require to be tempered, being sufficiently hard to preserve the magnetism communicated to it. Figures of any kind may be traced on the surface of the steel plate, either by one magnet or by several combined; and the best form for this purpose is that in which the poles are rounded. In this way we may write upon a steel plate the name of a friend, or sketch a flower or a figure, with the extremity of a magnet. If it is a south pole that we use, all the traces which it makes will have north polar magnetism; and if we shake steel filings upon the plate out of a gauze bag, the filings will arrange themselves in the empty spaces between the lines traced by the pole of the magnet, and thus represent in vacant steel the name which has been written, or the flower or figure which has been sketched. "These figures," says M. Haldat, "have a perfect resemblance to those which are formed on the surface of non-magnetic plates, viz. wood, card, glass, or paper, under which a magnet is placed. The resemblance between the two sorts of figures, when the magnets and the parts magnetised have the same form, is not only exact in the whole figure, but even in the smallest details. The filings collect at the parts where the magnetism is most intense, they arrange themselves in pencils and radii, and form the same curves which we have represented in fig. 1, page 702. These curves, and pencils, and rays, so similar at the two poles of the same magnet, have such a resemblance that they do not allow us to distinguish the two parts from one another."

General Properties of Magnetic Bodies.

Magnetic figures.

M. Haldat has likewise produced these curves by interposing between the tracing magnets and the steel plates solid non-magnetic bodies, such as cards, glass, and even metallic plates that are not ferruginous. This method of producing magnetism in the steel plate by induction gives the same figures; but, in order to be efficacious, the magnet must have its pole carried parallel to and at a small distance from the plate of steel, and must repeat its traces, in order that the magnetism may be sufficiently developed. For rectilineal figures, M. Haldat employs rules with grooves, which keep the motion and distance of the bar invariable; for curvilineal figures he interposes some thin and uniform plate, and he can vary the distinctness of the figures by varying the distance of the tracing pole of the magnet.

In sifting the iron filings upon the steel plate, a gentle vibration of the plate, by tapping its edge with the ring of a small key, will assist the filings in taking their proper places; but we must avoid such vibrations as will produce regular acoustic figures, unless we wish, as M. Haldat has found to be practicable, to unite the magnetic with the acoustic figures, which produces very interesting and varied forms.

M. Haldat has found that the magnetic figures will continue for six months. In order to remove the magnetism which produces them, he recommends the heating of the plate upon red-hot charcoal, till it is brought to the straw-yellow temperature. In order to render the repolishing of the plate unnecessary, M. Haldat tins it, and the temperature at which the tin melts, when it is required to efface the magnetism, indicates the necessary heat. M. Haldat employs also another method, which is perhaps the best. He places the steel plate upon a block of wood, and by repeated and violent blows of a wooden hammer he removes the magnetism of the plate, the figures gradually becoming weaker and weaker when the experiment is tried with it in different stages. The effect is often produced in three or four minutes.

As the figures traced on the steel are nothing more than magnets of different forms, and are surrounded on all sides with a substance capable of acquiring the magnetism which may be developed by communication, we might expect, as M. Haldat remarks, that this means of communication between the opposite poles of the magnets would bring them into a neutral state. This, however, is not the case, and the portion of the metal which surrounds the magnetic figure performs the part of the *armature* of a loadstone, and the magnetism is thus kept up. If the figure be a simple rectangle, like that of a bar-magnet, the state of the plate, examined with a small needle, is exactly the same as a bar-magnet, and the parts which surround this magnetic portion are in a neutral state, as if unconnected with the rectangular space; from which it follows that the magnetic virtue, which communicates itself so easily by influence, ceases to communicate itself between the continuous parts of a magnetisable body, of which one portion is magnetic, and the rest in a neutral state.

Improvements on M. Haldat's method.

In carrying into effect the preceding method of making magnetic figures, a very great difficulty must be experienced in recollecting the invisible traces made by the pole of the magnet, so as to complete a regular figure or drawing. When the figures are made *immediately*, as M. Haldat ex-

Magnetic figures.

presses it, that is, by the actual contact of the pole of the magnet, without any intermediate body, the best method would be to cover the plate of steel with the slightest coating of grease, and sift upon the surface, through a linen bag, some of the finest flour. The pole of the magnet, while tracing the figures on the steel, will remove the flour, and thus exhibit to the eye an accurate picture of what it has traced; and it will thus be easy to make the magnetic figures more distinct by repeating the traces with the magnet. The same thing may be done by putting an etching ground upon the steel plate, and tracing the figure as before. When the figure is completed, the coating of grease and flour, or the etching ground, must be removed previous to the application of the iron filings.

When the figures are to be produced *mediately*, or by the intervention of a non-magnetic substance, such as paper, card, wood, or glass, a fine dust may in like manner be laid upon the surface; but when the interposed substance will receive the mark of a pencil or sharp point, it would be preferable to attach to the cylindrical pole of the tracing magnet a very short point of a non-magnetic substance, which would make a visible mark on the paper, card, or wood, without strewing any fine dust on their surfaces. By the use of such a point, indeed, we may dispense altogether with the interposed substance, and communicate the magnetism by induction to the steel plate, in the very same way as if it had been done by the intervention of a non-magnetic plate whose thickness is equal to the length of the short point or tracer affixed to the pole of the magnet.

The magnetic figures might be rendered permanent by covering the steel plate either with a gummy or balsamic solution, which will indurate by exposure to the air; or with a coating of some easily melted substance, which becomes fixed at ordinary temperatures. If we sift the iron filings on the steel plate when covered with such a fluid, the filings will take their magnetic position round the traced lines, and will become fixed by the induration or solidification of the fluid coating.

CHAP. III.—ON THE MAGNETISM OF BODIES NOT FERRUGINOUS.

SECT. I.—*On the Magnetism of Metals, Minerals, and other Bodies.*

Magnetism of metals, &c. not ferruginous.

Iron was long regarded as the only body endowed with the property of acting and of being acted upon as a magnet; and though other metals and substances have been recently found to possess the same property, and though all substances whatever have been found by Coulomb to obey the power of a strong magnet, yet it is still a matter of doubt whether the magnetic effects thus produced are owing to a magnetism residing in the proper substance of the body, or are owing to a minute quantity of iron which enters into their composition.

Magnetism of nickel.

The most magnetic metal next to iron is *nickel*. It receives and retains communicated magnetism longer than any other metal, and needles of nickel have a distinct polarity. These properties have been found in nickel after it has been repeatedly purified, though some authors have stated that they could not detect this property in certain specimens. A very decisive and instructive experiment on the magnetic qualities of nickel was made by M. Biot.[1] He possessed a needle of nickel which had been purified by M. Thénard. It was 212 millimetres long, six broad, and 5·178 grains in weight. Having made a needle of steel of exactly the same dimensions, and which weighed 4·586 grains, he magnetised them both to saturation, and caused them to oscillate in the magnetic meridian. The nickel needle performed ten oscillations in eighty-seven seconds, and the steel one the same number in forty-five and a half seconds. As the shape of the needles was the same, the momenta of their directive forces were directly as their weights, and inversely as the squares of eighty-seven seconds and forty-five and a half seconds, that is, as 0·3088 to 1, that is, the directive force of the needle of nickel was *nearly one third* of that of the steel needle. Now it is impossible to suppose that purified nickel could contain such a large proportion of iron as is necessary to produce such a degree of magnetic polarity, without its being easily recognised by the chemist; and M. Biot supposes that the magnetic power of the nickel might have been still farther increased by the means which are used to modify the coercive power of steel and iron.

Brass.

A series of careful experiments were made by M. Cavallo, on the magnetism of *brass* when hammered. He found that brass, whether old or new, British or foreign, was made magnetic when placed between two pieces of card and hammered on an anvil with a common hammer; and that the magnetism thus imparted was always removed by making the brass red hot, and could be again communicated to it. Lest it might be supposed that ferruginous matter might pass to the brass through rents or openings in the card, he hardened a piece of brass by beating it between two large flints, using one piece as a hammer, and the other as an anvil. The hammered brass became magnetic, but not so strongly as before; which arose probably from the rough and irregular surfaces of the flints, which prevented the brass from being hardened as uniformly as it was with the steel hammer. The flints, before and after the experiment, did not possess the slightest magnetism.

The degree of magnetism communicated to brass by hammering is vaguely stated by Cavallo to have been such "as to attract either pole of the needle from about a quarter of an inch distance." The following are the conclusions which M. Cavallo has drawn from these and other experiments:

"1*st*, That most brass becomes magnetic by hammering, and loses its magnetism by annealing or softening in the fire, or at least its magnetism is so far weakened by it, as afterwards to be only discoverable when set to float on quicksilver.

"2*d*, The acquired magnetism is not owing to particles of iron or steel imparted to the brass by the tools employed, or naturally mixed with the brass.

"3*d*, Those pieces of brass which have that property, retain it without any diminution after a great number of repeated trials, viz. after having been repeatedly hardened and softened.

"4*th*, A large piece of brass has generally a magnetic power somewhat stronger than a smaller piece, and the flat surface of the piece draws the needle more forcibly than the edge or corner of it.

"5*th*, If only one end of a large piece of brass be hammered, then that end alone will disturb the magnetic needle, and not the rest.

"6*th*, The magnetic power which brass acquires by hammering has a certain limit, beyond which it cannot be increased by farther hammering. This limit is various in pieces of brass of different thicknesses, and likewise of different qualities.

"7*th*, Though there are some pieces of brass which have not the power of being rendered magnetic by hammering, yet all the pieces of magnetic brass that I have tried lose their magnetism, so as no longer to affect the needle, by being made red hot, excepting indeed when some pieces of iron are concealed in them, which sometimes occurs; but in this case the piece of brass, after having been made red hot and cooled, will attract the needle more forcibly with one part of its surface than with the rest of it; and hence, by turning the piece of brass about, and presenting every part of it successively to the suspended magnetic needle, one may easily discover in what part of it the iron is lodged.

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[1] *Traité de Physique*, tom. iii. p. 126.

"8*th*, In the course of my experiments on the magnetism of brass, I have twice observed the following remarkable circumstance: A piece of brass which had the property of becoming magnetic by hammering, and of losing the magnetism by softening, having been left in the fire till it was partially melted, I found upon trial that it had lost the property of becoming magnetic by hammering; but having been afterwards fairly fused in a crucible, it thereby acquired the property it had originally, viz. that of becoming magnetic by hammering.

"9*th*, I have likewise often observed, that a long continuance of a fire so strong as to be little short of melting hot, generally diminishes, and sometimes quite destroys, the property of becoming magnetic in brass. At the same time the texture of the metal is considerably altered, becoming what some workmen call *rotten*. From this it appears, that the property of becoming magnetic in brass by hammering, is rather owing to some particular configuration of its parts, than to the admixture of any iron; which is confirmed still farther by observing that Dutch plate brass (which is made, not by melting the copper, but by keeping it in a strong degree of heat whilst surrounded by *lapis calaminaris*) also possesses that property, at least all the pieces of it which I have tried have that property. From these observations it follows, that when brass is to be used for the construction of instruments wherein a magnetic needle is concerned, as dipping needles, variation compasses, &c. &c. the brass should be either left quite soft, or it should be chosen of such a sort as will not be made magnetic by hammering, which sort, however, does not occur very frequently."

These judicious suggestions of M. Cavallo respecting the condition of the brass parts of azimuth compasses were not attended to as they ought, and we have no doubt that various grave errors have arisen from their neglect. Many examples have recently occurred, in which the errors were detected; and it is now the invariable practice of well-informed instrument-makers to reject hammered brass bowls for compasses, and to use those which are cast and turned for the purpose.

M. Cavallo and others have observed, that cobalt, zinc, copper, and bismuth, as well as their ores, are attracted by the magnet and antimony when gently heated. Minerals which are not metallic are almost all acted upon by the magnet, particularly where they have experienced the action of fire. The pure earths, and particularly silex, are found to have the same property. Among minerals, the following table shows those which are attracted and those which are not attracted by the magnet; but we place little faith in their accuracy.

Minerals not attracted.	Minerals attracted.
Diamond.	Oriental ruby.
Pellucid crystals.	Chrysolite.
Amethyst.	Tourmaline.
Topaz.	Emerald.
Calcedony, and other crystals whose colouring matter is expelled by heat.	Garnet.
	Several micas containing iron.

Some accurate experiments have been made on mica by M. Biot. The chemical composition and optical structure of different varieties of this mineral vary greatly. M. Biot examined particularly mica from Siberia and mica from Zinwald in Bohemia. Though both were highly pellucid, yet chemical re-agents indicated in each the existence of oxide of iron. In the Bohemian mica it was greatest, and, according to an accurate analysis by Vauquelin, amounted to 20 per cent. Before the Siberian mica was analysed, M. Biot tried their magnetic properties. He cut out of each, thin rectangular plates of the same form, which he subdivided into smaller similar pieces, and having united them in a bundle, he suspended each bundle by a silk fibre, and caused each bundle to oscillate in succession between the poles of two strong magnets. The bundle of Zinwald mica performed twelve oscillations in fifty-five seconds, and that of the Siberian mica only seven in the same time. Hence the magnetic powers of the two micas were as 6·8 to 20, the ratio of 49 and 14 to the squares of the number of oscillations. If the oxide of iron, then, be the cause of their magnetic virtue, it should exist in the above proportions of 6·8 to 20; and as it was found to be 20 per cent. in the Zinwald mica, it ought to be 6·8 in the Siberian. It is very remarkable that the result of Vauquelin's analysis gave exactly this per centage of the oxide of iron, though it was not known to M. Biot till his experiment had been made.

Magnetism of Bodies not Ferruginous.

Magnetism of combined metals.

The existence of magnetism in brass, while there was not the least trace of it either in the copper or zinc of which it is composed, led philosophers to investigate the effects produced by the union of different metals, or by their combination with other substances. *Iron* itself is a simple chemical body. *Steel* is a combination of iron and carbon. The *loadstone* is a combination of iron and oxygen; and as no magnetism is found either in carbon or oxygen, we are naturally led to believe, as M. Pouillet has remarked, that the magnetic fluid resides in the substance of the iron, and that it is carried with the atoms of that metal into all the chemical combinations which they form. We may therefore expect to find magnetic properties more or less developed in all ferruginous bodies, whether the iron be an accidental or an essential ingredient; and indeed cast iron, plumbago, and the oxides and sulphurets of iron, exert a sensible action on the magnetic needle.

Anti-magnetic bodies.

These views, however, are not in unison with facts which seem to have been well ascertained. Dr Matthew Young found, that the smallest admixture of antimony was capable of destroying the polarity of iron; and M. Seebeck states, that an alloy of one part of iron and four parts of antimony was so completely destitute of magnetic action, that, even when it was put into rotation, it exerted no power over the magnetic needle. The magnetic qualities of nickel also are destroyed by a mixture with it of other metals. Chenevix found that a very small proportion of arsenic deprived a mass of nickel which had previously exhibited a strong magnetic power, of the whole of its magnetism; and Dr Seebeck found that an alloy of two parts of copper with one of nickel was entirely devoid of magnetism, and on this account he recommends it as well suited for the manufacture of compass boxes. On the other hand, Mr Hatchet ascertained, that when a large proportion of *carbon*, or *sulphur*, or *phosphorus*, was combined with iron, the iron was enabled fully to receive and retain its magnetic properties; but he at the same time found that there was a limit beyond which an excess of any of these three substances rendered the compound wholly incapable of receiving magnetism.

Animal and vegetable substances, after combination, are said to be attracted by the magnet. The flesh, and particularly blood, are acted upon more powerfully than other parts, and bone less powerfully. Burned vegetables have the same property, and also soot and atmospheric dust; and M. Cavallo has maintained, that brisk chemical effervescence acted upon the magnetic needle.

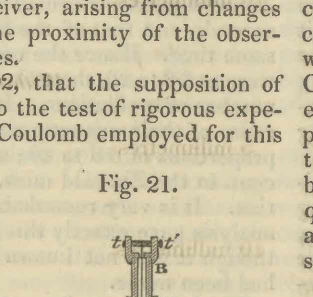
SECT. II.—*Account of the Experiments of Coulomb, Becquerel, Arago, and Seebeck, on the Existence of Universal Magnetism.*

Universal magnetism.

These various experiments on the magnetic power of so many classes of bodies, differing essentially in their composition, and in many of which it could not be reasonably supposed that iron existed, led some philosophers to believe that almost all substances gave indications of magnetism. M. Cavallo announced this opinion, but Mr Bennet questioned the accuracy of the experiments, and ascribed the movements observed in the needle to the agitation of the air in the receiver, arising from changes of temperature produced by the proximity of the observer's body, or from other causes.

Coulomb's experiments.

Fig. 21.



It was not therefore till 1802, that the supposition of universal magnetism was put to the test of rigorous experiment. The apparatus which Coulomb employed for this purpose is shown in fig. 21, where AA is a glass receiver perforated at its top, and having a tube A′B, with a cork B, which could be raised and lowered with facility. Through this cork passed a rod *tt* of wood or metal, to which was attached a silk fibre, which suspended a ring of very fine paper, on which the small needle *ns* (about the third of an inch long and $\frac{1}{30}$th thick) was placed. The receiver was then placed so as to enclose the opposite poles N, S of the powerful magnets M, M, each formed of four bars of steel tempered to a white heat. Each bar was seventeen inches long, three fifths of an inch wide, and one sixth of an inch thick, each bundle of four bars being one and three eighths of an inch wide, and one third of an inch thick. The distance N S of their poles was eight tenths of an inch. In making the experiments, the rod *tt* was turned till the needle *ns* was removed from the influence of the magnets; and after the number of its oscillations was observed, the rod *tt* was turned till the needle descended between the poles N, S of the magnets, when the number of oscillations of the needle was again counted, or the time in which a given number of oscillations was performed. If the needle performed the same number of oscillations in the same time, whether it oscillated between the poles N, S, or beyond their influence, it is obvious that the magnets exercised no power over them; but this was never the case, and Coulomb found that all substances whatever, when formed into small needles, turned themselves in the direction of the poles N, S, and, after a few oscillations, finally settled in that position. When these bodies were moved a very little way out of their position of equilibrium, they immediately began to oscillate round it, the oscillations being always performed more rapidly in the presence of the magnets than when they were removed out of their influence. Gold, silver, glass, wood, and all substances, whether organic or inorganic, thus obey the power of the magnets. Hence we cannot avoid the conclusion, either that all bodies are susceptible of magnetism, or that they contain minute quantities of iron, or other magnetic metals, which give them that susceptibility. M. Biot does not consider this alternative so inevitable as it appears, and throws out the conjecture, that the action may not be magnetic, but may be owing to some small force similar or analogous to the electrical forces developed by the simple contact of heterogeneous bodies. This no doubt might be, if there was any contact; and, in the absence of any reasons whatever for ascribing the observed effects to another cause, we cannot but rest between the alternative opinions above mentioned, giving a preference to that which ascribes the phenomenon to the existence in all bodies of a slight susceptibility to magnetic action.

This opinion derives considerable support from the experiments made by Coulomb on the comparative magnetic susceptibilities of cylindrical needles of gold, silver, lead, copper, and tin, which had been purified with the greatest care by MM. Sage and Guyton, and the results of which we have already given in our history of magnetism. M. Coulomb made a number of experiments on the effects experienced by needles of white wax, containing different proportions of iron filings, and he found that the intensities of the action which they experienced when oscillating between two magnets, was proportional to the absolute quantities of iron which they contained, the distribution and chemical state of the ferruginous particles being the same.

Since the time of Coulomb, methods different from his have been employed in developing magnetism in all bodies whatever. In order to detect small quantities of iron in minerals, M. Haüy employed the process of what he calls *double magnetism.* For this purpose, he placed a small bar-magnet in the direction of the needle, and in the same horizontal plane, the two similar poles being placed towards each other. The magnet being now brought slowly towards the needle, the latter deviates from the direction of the magnetic meridian, and takes a position perpendicular to it; an effect arising from the combined action of the poles of the magnet and the earth upon the magnetism of the needle. In this position, *a very feeble magnetic action* is sufficient to make the needle turn round and place its south pole opposite the north pole of the needle.

When the magnet is above the plane of the needle, and their opposite poles placed near each other, the needle does not change its direction while the point of suspension is beyond the bar, and at a suitable distance; but it is not so when the distance changes, for it tends continually to place itself perpendicular to the line of the poles.

Researches of M. Becquerel.

This important subject has been investigated by M. Becquerel, who obtained the following results.[1] His bar-magnet consisted of six united bars, each eight decimetres long and two centimetres broad. The needle was placed at different heights within and without the bar, and he sought to determine for each height the horizontal distance from the point of suspension (which is always in the line of the poles) to the nearest extremity of the needle, in order that its direction might be perpendicular to that line. The results were as follow:

Vertical Distances from the Centre of Suspension to the Bar.	Horizontal Distances of the Centre of Suspension to the Extremity, in order that the Needle might take a perpendicular position.
Millimetres.	Millimetres.
100	60 within.
150	55
200	46
250	23
300	12
350	45 without.
400	82

Hence it appears, that when the centre of suspension is above the bar, the perpendicular position is obtained by increasing the vertical and diminishing the horizontal distance; and that both these distances are increased while the centre of suspension is below the bar; and the direction of the deviation depends on accidental causes, and is often determined by the simple motion of the apparatus.

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[1] *Traité Exp. de l'Electricité, &c.* tom. ii. p. 387.

When M. Becquerel substituted for his magnetic needle a needle of soft iron, the results were exactly the same, differing only in their intensity. We come now to the original part of M. Becquerel's inquiry. Instead of a needle he used a small paper case filled with *deutoxide of iron*, or a mixture of deutoxide and tritoxide. With the former the effects were the same as with the steel needle; but it was different with the latter, in which one part of deutoxide was mixed with thirty parts of tritoxide.

If the centre of suspension be placed as near as possible to the north pole of the bar-magnet, and in the line of the poles, the paper case will take immediately a direction perpendicular to this line, instead of one coincident with it, as a soft iron needle would have done. If we put it out of this direction, it will return to it by a series of oscillations, whose velocity depends on the quantity of the deutoxide. From this it follows, that *all the south polar magnetism of the paper case is situated on the side of it next the bar-magnet, while the north polar magnetism is on the other side*, as may be exhibited by carrying a small magnetic needle along the paper case. Such a distribution of magnetism is impossible in soft iron or tempered steel.

If the centre of suspension be above the bar, the paper case will deviate from the position which it had at first, and tend to place itself in the direction of the line of the poles; an effect quite opposite to that produced by a steel or iron needle. The following were the experimental results:

Vertical Distances of the Centre of Suspension from the Bar.	Horizontal Distances of the same Centre to one of the Extremities of the Bar.	Deviations of the Paper Case from the Direction perpendicular to the Line of the Poles.
10 millimetres,	5	24°
	10	44
	15	60
	20	73
	25	78
	30	84
20 millimetres,	5	50
	10	65
	15	73
	20	77
	30	32
30 millimetres,	5	70
	20	76
	30	82

The *transverse magnetism* acquired by the paper case is permanent for some time, however small may be the proportion of deutoxide which it contains.

M. Becquerel next filled the paper case with very pure tritoxide, obtained by calcining nitrate of iron. The effect was much weaker than before. When the point of suspension was very near one of the extremities of the bar, the paper case still placed itself in a position perpendicular to the line of the poles; but if this point was placed above or below the bar, changing at the same time the vertical distance, the paper case deviated from its primitive direction, without, however, taking a direction perpendicular to that which it commonly takes when the centre of suspension is very near the extremity. It might be possible, M. Becquerel thinks, to attain the perpendicular direction by employing much stronger magnets. The following were the experimental results:—

Magnetism of Bodies not Ferruginous.

Vertical Distances from the Point of Suspension to the Bar.	Horizontal Distances of the same Point from the end of the Bar.	Deviations from the Direction perpendicular to the Line of the Poles.
	Without the Bar.	
5 millimetres,	5	25°
	10	34
	15	48
	20	55
	25	70
10 millimetres,	5	32
	10	37
	15	43
	20	46
	25	40
	Within the Bar.	
5 millimetres,	10	26
	15	...
	20	45
	25	51
10 millimetres,	10	20
	15	30
	20	45
	25	50

Whenever the tritoxide contains the smallest quantity of the deutoxide, the velocity of the oscillations increases very powerfully. If, for example, we take *two* paper cases, one filled with tritoxide, and the other with tritoxide mixed with one thirtieth of the deutoxide, the first will perform twelve oscillations in thirty seconds, round a direction perpendicular to the line of the poles, while the other will execute twenty-five in the same time. Hence we may by this means readily determine the quantity of the deutoxide of iron contained in the tritoxide.

With needles of wood, &c.

M. Becquerel next employed needles of wood, gum-lac, and other substances, which have still a feebler magnetism than the tritoxide of iron. He placed a needle of white wood, *n s*, four centimetres long and two millimetres in diameter, above the interval between the opposite poles of two bar-magnets, as in fig. 21, the distance between N and S being three or four millimetres. The point of suspension was as near as possible to N S. The needle placed itself perpendicular to the line of the poles N, S, in place of the position observed by Coulomb, coincident with N S. It comports itself therefore like the mixture of deutoxide and tritoxide of iron, or like the tritoxide alone. But if we separate gradually the extremities N, S of the bars, the wooden needle will place itself in the line N S, joining the poles, as shown in the figure. The deviations were as follow:

Distances of N, S.	Deviations of the Wooden Needle from the perpendicular position.
3 or 4 millimetres,	0°
10	18
20	36
30	56

When the bars are very close, and the needle in the perpendicular position, if we draw it out of this position, and keep it some instants in the direction of this line, it will remain there; but the smallest motion will cause it to return into its primitive direction, which it takes in preference to any other.

If we use only one bar-magnet, and place the wooden needle precisely opposite one of its poles, and as near as possible to the end of the bar, it will still direct itself perpendicularly to it; but if, while the point of suspension remains always in this line, we advance it within the bar, the needle will deviate from its direction, without, however, reaching the position of 90°, as will be seen from the following results:

Magnetism of Bodies not Ferruginous.

Distances of the Centre of Suspension from the Extremity of the Bar.	Deviations of the Wooden Needle.
5 millimetres,	12°
10	18

Beyond ten millimetres the deviations increase insensibly and irregularly, so that they cannot be measured.

General conclusion.

From these interesting experiments, M. Becquerel concludes that the magnetic effects produced by a strong bar-magnet upon a magnetic needle, or one of soft iron, differ essentially from those which take place in all bodies where the magnetism is very weak. In the former, whatever be their positions and directions, the magnetism is always distributed in the direction of their length, to the exclusion of every other direction; whereas in the tritoxide of iron, wood, and gum-lac, it is distributed in a direction which depends on the distance of the body from the poles of the magnet, so that the distribution varies with the direction which the magnet causes these needles to take, in virtue of the action which it exercises over them.

Discoveries of M. Arago.

The universal prevalence of magnetism in all bodies whatever has been established by a beautiful discovery of M. Arago. This distinguished philosopher conceived the idea of studying the oscillations of a magnetic needle when placed above or near any body whatever. Having suspended a magnetic needle above metal, or even water, and caused it to deviate a certain number of degrees from its position, it began, when left to itself, to oscillate in arcs of less and less amplitude, as if it had been placed in a resisting medium; and, what was peculiarly curious in these experiments, this diminution in the amplitude of the oscillations did not alter the number of oscillations which were performed in a given time. The following were some of M. Arago's experiments with *water*, *ice*, and *glass*, the semiamplitude of the oscillations being at the instant 43°.

The distance of the water from the needle was..0·65 millim.
The amplitude lost 10° in.....................30 oscillations.
When the distance was.......................52·2 millim.
A loss of 10° of amplitude required..........60 oscillations.

That is, the number of oscillations required to diminish the amplitude 10° was twice as great when the distance of the needle from the water was 52·2 millimetres, as when it was 0·65.

By placing the same needle upon ice, M. Arago obtained the following results:

Distances of the Needle from the Ice. Millimetres.	Diminution of the Amplitude.	Number of Oscillations by which this diminution was effected.
0·70	From 53° to 43°	26 oscillations.
1·26	From 53 to 43	34
30·50	From 53 to 43	56
52·20	From 53 to 43	60

By placing another needle near a plate of crown glass, he obtained the following results:

0·91	From 90° to 41°	122
0·99	From 90 to 41	180
3·04	From 90 to 41	208
4·01	From 90 to 41	221

Plates of metal afforded M. Arago similar results; but he nevertheless observed that those metals which act with more energy than glass, wood, &c. have a mode of action different from that of these substances. From all these results, it is manifest that all bodies, when placed near a magnetic needle in a state of oscillation, exercise over it an action, the effect of which is to diminish the amplitude of its oscillations, without altering their number; and hence the doctrine of the universal prevalence of magnetism in all bodies derives a new confirmation.

Development of Magnetism in all Bodies by Rotation.

When Dr Seebeck of Berlin heard of the discovery of M. Arago, he made a magnetic needle two and an eighth inches long oscillate at a distance of three lines above plates of various bodies, and counted the number of oscillations which were required in each case to reduce the amplitude from 45° to 10°.

Substances employed.	Thickness of the Plates.	Number of Oscillations of the Needle.
Marble	0·0 line	116 oscillations.
Mercury	2·0	112
Bismuth	2·0	106
Platina	0·4	94
Antimony	2·0	90
Lead	0·75	89
Gold	0·2	89
Zinc	0·5	71
Tin	1·0	68
Brass	2·0	62
Copper	0·3	62
Silver	0·3	55
Iron	0·4	6

Dr Seebeck found, that in alloying magnetic with non-magnetic substances, he formed *compounds which exercised no action on the magnetic needle.* The alloys which had particularly this singular property were those consisting of four parts of antimony and one of iron, or two parts of copper and one of nickel. In these cases the magnetism of the two ingredients must have been neutralized by their opposite actions.

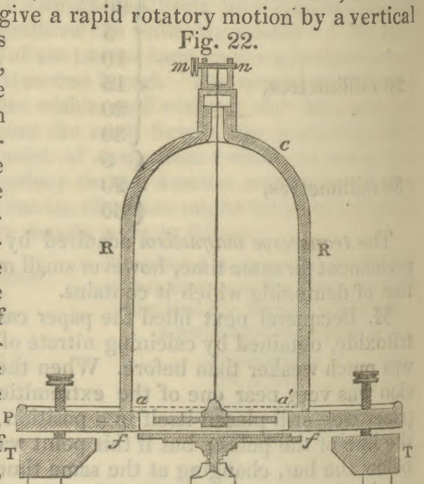
CHAP. IV.—ON THE DEVELOPMENT OF MAGNETISM IN ALL BODIES BY ROTATION.

M. Arago's experiments.

When M. Arago was engaged in the experiments described in the preceding chapter, the idea occurred to him of trying if the magnetic needle would be dragged along by the rotatory plates which had the power of diminishing the amplitude of its oscillation. This happy conjecture was immediately confirmed by experiment, and one of the most beautiful discoveries added to the science of magnetism.

The apparatus which he used for this purpose is shown in Plate CCCXXV. fig. 3, where H is a clock made of copper, with the exception of two or three pivots, which are of steel. It is supported on a tripod stand TT, which can be levelled by screws S, S at the end of its three feet; and the object of it is to give a rapid rotatory motion by a vertical axis, on which is fitted a piece *a*, *b*, *c*, fig. 4, with three branches, upon which the revolving discs are to be placed. These discs are perforated at their centre by a small hole which receives the prolongation of the axis of rotation, and they are kept upon the branches *a*, *b*, *c*, by the pressure of a screw. Wings *w*, *w*, *w* (fig. 4), which can be inclined at any angle, are applied for the purpose of retarding the velocity of the discs. A plate PP, with an opening in its centre a little larger than the diameter of the discs, rests upon the table TT, and a sheet of paper *f f*, shown in fig. 22 (which is an enlarged view of that part of the apparatus),

Fig. 22.



is pasted to the lower face of PP. A glass receiver RR rests upon the upper face of PP, and within it is suspended the magnetic needle *aa′*, by a fibre of silk attached to the axis and button *mn*, by which the needle can be raised or depressed. A weight W gives motion to the clock, and a hand indicates upon the dial-plate the number of revolutions performed by the disc in a given time.

When a disc of copper was placed on the support *a*, *b*, *c*, Plate CCCXXV. fig. 4, as shown at PP, fig. 22, and the copper made to revolve beneath the needle *aa′*, with the sheet of paper *ff* intervening, the needle *aa′* is drawn out of the magnetic meridian the instant that the copper begins to revolve, and with a degree of force proportional to the velocity of rotation. As the force with which the needle s dragged from its place is opposed to the magnetic action of the earth, which tends to keep the needle in the magnetic meridian, the needle will take a position of equilibrium depending on the ratio of these forces. When the motion of the copper disc, however, is very rapid, the magnetism of the earth is overpowered by that of the revolving plate, and the needle does not stop, but continues o turn. The action of the revolving disc decreases in proportion as the distance of the needle from the plate PP is increased, the velocity being the same; so that if he motion of the needle be continuous when the two bodies are separated only by a sheet of paper, the needle will take a fixed position by increasing its distance from he plate; and its deviation from the magnetic meridian becomes less and less as it is removed to a greater height above the disc. When the plates have portions cut out n the direction of their radii, their action on the needle is diminished.

In trying plates of various metals, M. Arago found the results so dependent on the alloy which the metals conained, that he did not publish the results which he obained. He devoted his attention to the determination of he directions of the force which is developed in the revolving discs, and for this purpose he sought the components of this force in the direction of three lines parallel to three co-ordinate planes perpendicular to each other. The *component* perpendicular to the plate he found to be a repulsive force, which may be rendered sensible by means f a very long magnet suspended by a thread vertically to he extremity of the arms of a balance kept in equilibrium y a weight at the other extremity. The moment that he plate begins to revolve, the magnet is repelled, and the eam of the balance inclines to the other side. The *seond* component is horizontal and perpendicular to a verical plane which contains the radius abutting against the projection of the pole of the needle. This is the force which gives a motion of rotation to the needle, and it acts n the direction of a tangent to the circle. The *third* component is parallel to the radius which abuts against he projection of the pole of the needle. It may be deermined with a dipping needle placed vertically, so that s axis of rotation is continued in a plane perpendicular o one of the radii of the disc. A similar needle placed t the centre of the disc experiences no action. There is also a second point, nearer the margin than the centre, here a needle experiences no change in its position; but etween these points the lower pole is constantly attracted towards the centre, while it is repelled beyond that point.

Development of Magnetism in all Bodies by Rotation.

No sooner were M. Arago's experiments announced to the Institute, which was done at the sitting of the 7th March 1825, than philosophers in every part of Europe repeated them, and succeeded in adding several important facts to those discovered by M. Arago. MM. Babbage, Herschel, Barlow, Nobili, Baccelli, Christie, and MM. Prevost and Colladon, took a prominent part in these researches. The results obtained by Messrs Babbage and Herschel were the most important, and the experiments were made in a manner different from those of M. Arago. A horse-shoe magnet, which lifted twenty pounds, was made to revolve rapidly round its axis of symmetry, placed vertically, with its poles uppermost. A circular disc of copper, six inches in diameter and $\frac{1}{24}$th of an inch thick, was suspended above the revolving magnet. As soon as the rotation of the magnet commenced, the copper began to turn in the same direction, at first slowly, but afterwards with an increasing velocity. When the magnet was made to turn in the opposite direction, the disc of copper changed the direction of its motion also, and exhibited the same phenomena. Metallic plates, ten inches in diameter and half an inch thick, when interposed between the magnet and the copper disc, did not sensibly modify the results, as M. Arago had observed. Glass produced no effect, but a sheet of tin-plate iron diminished greatly the influence of the magnet, while two such plates almost destroyed it. They also found that a disc of copper ten inches in diameter, and half an inch thick, and revolving with a velocity of seven revolutions in a second, did not communicate any motion to a similar disc freely suspended above it.

Experiments of Messrs Babbage and Herschel.

In comparing the influence of different metals, each disc had the same diameter and the same velocity; and the following were the results which were obtained by this and another method of observation.

	Ratio of the Force to that of Copper.	Ratio by another Method.
Copper	1·00	1·00
Zinc	0·90	1·11
Tin	0·47	0·51
Lead	0·25	0·25
Antimony	0·11	0·01
Mercury	0·00	0·00
Bismuth	0·01	0·00
Wood	0·00	0·00

The second method of observation by which the results in the last column were obtained was more expeditious than the first. Portions of different bodies of the same form and dimensions were suspended above a revolving magnet, and the time of successive oscillations and the points of equilibrium were observed.

Our authors next sought to determine the effect produced by a solution of continuity in the metallic disc upon which the revolving magnet acted. For this purpose a disc of lead twelve inches in diameter and one tenth of an inch thick was suspended at a given distance from a horse-shoe magnet revolving with the ordinary rapidity, first in its entire state, and afterwards in the state shown in the annexed figures, the black lines in the direction of the radii be-

Fig. 23.

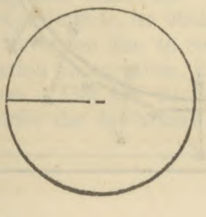


Fig. 24.

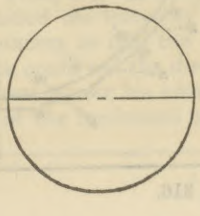


Fig. 25.

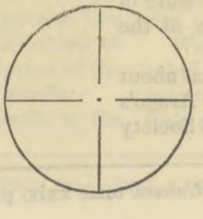


Fig 26.

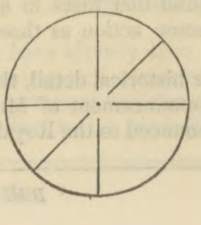
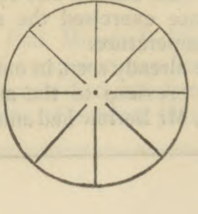


Fig. 27.



Development of Magnetism in all Bodies by Rotation.

ing the planes where the lead was cut through. The accelerating forces, represented by $\frac{s}{t^2}$, where s is the number of the revolutions, and t the time employed, are as follow:

Uncut Disc.	Disc as in fig. 23.	Disc fig. 24.	Disc fig. 25.	Disc fig. 26.	Disc fig. 27.
1258	1047	913	564	432	324

Effects similar, but differing in degree, were obtained with other metals. With soft tinned iron the cutting produced a very slight diminution of effect, whilst in copper the same operation reduced the accelerating force in the ratio of five to one.

Messrs Babbage and Herschel next tried the effect of filling up the cuts with other metals. A light upper disc, suspended at a given distance above a revolving magnet, performed six revolutions in 54″·8. When it was cut as in fig. 27, its magnetic action was so weakened that it took 121″·3 to perform six revolutions. When the eight open radial spaces were filled up with tin, its magnetic action was restored to such a degree that it made six revolutions in 57″·3. This fact is very interesting, as tin has less than half the energy of copper. The following results were obtained from other experiments, the numbers representing the accelerating forces or the magnetic energies developed in the plates.

Brass not cut	1·00
Brass cut	0·24
Brass soldered with bismuth	0·53
Brass soldered with tin	0·88
Copper not cut	1·00
Copper cut	0·20
Copper soldered with tin	0·91

Law of the force.

In determining the law of the force in relation to the distance, Messrs Babbage and Herschel found it to vary between the ratio of the square and the cube of the distance. Mr Christie found, that when the revolving disc was thick and the needle delicate, the force which produced the deviation of the needle increased directly as the velocity of rotation, and inversely as the fourth power of the distance. MM. Prevost and Colladon found that the angles of deviation, and not their sines, increased in the direct ratio of the velocity, at least within certain limits; and that the sines of the angles of deviation were in the inverse ratio of the two and a half power of the distance.[1]

Experiments of M. Haldat;

M. Haldat made some interesting experiments on this subject. He found that every needle, however weak was its magnetism, obeyed the action of the revolving disc; but that this action disappeared entirely when its polarity disappeared. He found it impossible to magnetise needles by the action of the revolving disc, however rapid; and, in consequence of ascribing this effect to the want of coercive power, he employed discs of iron and steel, both soft and hardened.

A disc of soft iron acted with more energy than one of copper, and with the same velocity it dragged the needle twice the distance that a disc of brass did. Iron strongly hammered acted like soft iron, and was unable to give polarity to a steel needle. But a disc of untempered steel one twenty-fifth of an inch thick did not produce any appreciable effect on the magnetic needle, which, after a few irregular oscillations, maintained its ordinary position of equilibrium. Hence our author concluded that the force which acted upon it was in the inverse ratio of the coercive force. M. Haldat also found that discs in a state of incandescence exercised the same action as those at the ordinary temperature.

of Mr Barlow.

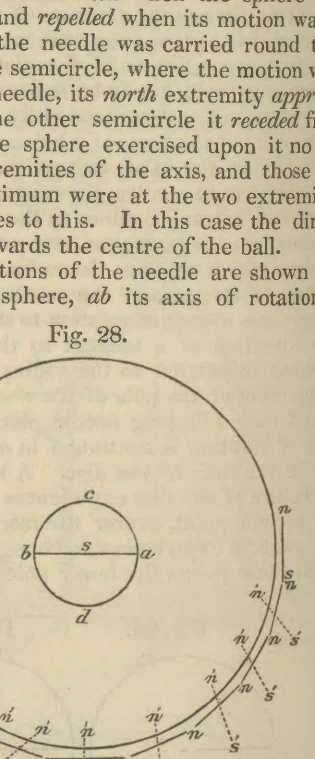
We have already seen, in our historical detail, that about six months previous to the announcement of M. Arago's discoveries, Mr Barlow had announced to the Royal Society of London the result of a series of experiments on the magnetic effects produced by iron in rotation. Having found that an iron ball performing 640 revolutions in a minute caused a magnetic needle to deviate several degrees, and to take a fixed position during the continuance of the motion; that the needle deviated in an opposite direction when the motion of the ball was reversed; that there were certain positions in which a bomb twelve inches in diameter, moved by a steam-engine, occasioned no deviation in the needle; that in some positions the deviation was in one direction, and in other positions in another; and that the deviation varied between 0° and 80°; he constructed a regular apparatus for determining the laws of these phenomena, and in which the iron which formed part of it should not influence the results. This apparatus is shown in Plate CCCXXV. fig. 2, where S is an iron sphere, made to revolve on a horizontal axis AB, by means of two wheels, like an electrical machine, their diameters being as six to one, so as to perform 720 revolutions in a minute. A table LM was placed near the sphere, for holding the needle, so that the needle could be placed in any position, either above or below the sphere. The table LM being brought to the height of the axis AB, the needle was placed successively in different positions round the sphere. The influence of the earth's magnetism on the needle being destroyed or neutralised by the action of a magnet properly placed for this purpose, and shown at NS standing vertically, Mr Barlow found, that whatever was the azimuth of the needle, its *north pole* approached the sphere S when the upper part of the sphere was moving *towards* the needle, and that its *south pole* approached the sphere when the upper part moved *from* the needle.

Development of Magnetism in all Bodies by Rotation.

Having placed the axis of rotation sometimes in the magnetic meridian, sometimes in the direction of east and west, and sometimes in intermediate positions, he found, that whatever was the direction of the axis of rotation, the needle being always a tangent to the sphere, the *north* end of the needle was *attracted* when the sphere moved *towards* the needle, and *repelled* when its motion was *from* the needle. When the needle was carried round the revolving sphere in the semicircle, where the motion was directed towards the needle, its *north* extremity *approached* the sphere, and in the other semicircle it *receded* from it. The points where the sphere exercised upon it no action were at the two extremities of the axis, and those where the effect was a maximum were at the two extremities of an axis at right angles to this. In this case the direction of the needle was towards the centre of the ball.

The different positions of the needle are shown in fig. 28, where *s* is the sphere, *ab* its axis of rotation, and

Fig. 28.



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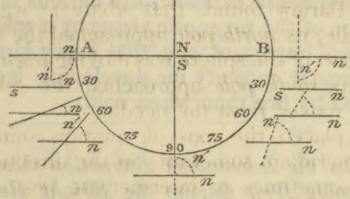
[1] *Bibl. Univers.* tome xxix. p. 316.

ed its equator. The lines *ns*, *ns*, &c. show the primitive position of the needle, and the dotted lines *n's'*, *n's'*, &c. those assumed by it when the motion is made from *c* to *d*. The effects are reversed when the motion is made from *d* to *c*.

If we carry the needle, when perfectly neutralised, round the sphere, and parallel to its axis, it has a tendency to place itself at right angles to the axis, and takes opposite directions at certain parts of the circle. If, for example, the axis be in the magnetic meridian, and the motion directed from the west to the east point of the horizon, the needle will direct itself to the west, and will do the same at all points between the horizon and an altitude of 60°. Beyond this the north end will direct itself to the east till it has passed the zenith 30° to the west; and then from this point to the west horizon, the north extremity will direct itself to the west, and similar changes will take place under the sphere. The same effects are produced, whatever be the direction of the axis and that of motion.

When a magnetic needle *not neutralised* is placed in different positions round the sphere whose axis is in the magnetic direction, the effects produced are as shown in fig. 29, where AB is the axis of rotation, the black lines representing the natural deviations of the needle, and the dotted ones those which it assumes when the sphere is in motion. Beginning at the point A, if the motion be from left to right, that is, from west to east, the needle moves from *n* to *n'* in the same direction till it arrives at 30°. It then remains in its natural direction. The needle moves in a contrary direction from right to left at 60°, 75°, and at 90°.

Fig. 29.



Mr Barlow was next desirous of ascertaining the different effects produced by a solid and a hollow ball of iron, and with this view he put in motion a solid ball 7·87 inches in diameter, and weighing sixty-eight pounds, and also a hollow sphere of iron, weighing only about thirty-four pounds. Both of them performed 640 revolutions in a minute, and the following were the average results:—

		Weight.
Mean deviation of the solid ball..........	28° 24'.......	68 lbs.
Mean deviation of the hollow ball......	15 5	34

When the two balls were at rest, the difference of their action was nothing.

Mr Barlow's paper on rotation was communicated to the Royal Society on the 14th April 1825, and on the 20th Mr Christie communicated one *On the Magnetism of Iron arising from its Rotation.* Mr Christie's experiments were made with circular plates of iron put in motion by an ingenious piece of machinery, by which he could make the plate revolve in every possible plane in reference to the magnetic meridian. From a great body of well-devised experiments, he obtained the following general law of the deviation due to rotation, so that the direction of the rotation being given, he could tell the direction of the deviation. This law we must give in his own words.

"I refer the deviations of the horizontal needle to the deviations of magnetic particles in the direction of the dip, or to those of a dipping needle passing through its centre; so that, in whatever direction this imaginary dipping needle would deviate by the action of the iron, the horizontal needle would deviate in such a manner as to be in the same vertical plane with it: thus, when the north end of the horizontal needle deviates towards the west, and consequently the south end towards the east, I consider that it has obeyed the deviation of the axis of the imaginary dipping needle, whose northern extremity has deviated towards the west, and its southern towards the east; so that the western side of the equator of this dipping needle has deviated towards the south pole of the sphere, and its eastern side towards the north pole. It would follow from this, that if the north and south sides of the equator of the dipping needle (referring to these points in the horizon) deviated towards the poles, no corresponding deviations would be observed in the horizontal needle; the effect, in this case, taking place in the meridian, would only be observable in the angle which the dipping needle made with the horizon. As it is not my intention at present to advance any hypothesis on the subject, I wish this to be considered only as a method of connecting all the phenomena under one general view. Assuming it then for this purpose, it will be found that the *deviations of the horizontal needle due to rotation* are always such as would be produced *by the sides of the equator of this imaginary dipping needle deviating in directions contrary to the directions in which the edges of the plate move*, that edge of the plate nearest to either edge of the equator producing the greatest effect on it."

Development of Magnetism in all Bodies by Rotation.

From another set of experiments, Mr Christie also found that the effect produced on the iron by its rotation is permanent so long as the plate remains stationary; that it is independent of friction; that it is so far independent of velocity, *that the iron can scarcely be moved so slowly that the whole effect shall not be produced; and that the whole effect is produced by making it perform one fourth of a revolution.* After Mr Christie had discovered these peculiar effects, he exhibited some of the phenomena to Mr Barlow, who conceived that the effect would be increased by rapid rotation, and who was thus led to make the experiments of which we have already given an account; but the phenomena differ essentially from those observed by Mr Christie, the former being temporary and dependent on velocity, while the latter are permanent, and independent of the rapidity of rotation.

In comparing the magnetic forces produced by rapid and slow rotation, Mr Christie found that the forces exerted on the needle during the rapid rotation of the plate are always in the same direction as the forces which are derived from the slowest rotation, and which continue to act after the rotation has ceased; but that the former forces are greater than the latter. From a mean of all the observations, the forces seem to be in the ratio of seventeen to thirteen, or very nearly of three to two. Hence Mr Christie conceives that the polarising of the iron in the same direction will account for the phenomena in both cases; but that the intensity of the polarity during the rapid rotation is greater than of that which appears to be permanent after the rotation, whether slow or rapid, has ceased; and that the phenomena observed during rapid rotation are such as should be expected from what have been described as arising from rotation, without regard to its velocity.

Experiments of Mr Snow Harris.

We have already seen that Messrs Babbage and Herschel interposed plates of various metals between the revolving magnet and the copper disc, and found no perceptible effect to be produced. Mr Snow Harris,[1] however,

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[1] *Phil. Trans.* 1831, p. 497.

Influence of Heat on Magnetism.

has recently shown that several substances not supposed to contain iron have the power of intercepting the influence of a revolving magnet. A circular magnetic disc being delicately balanced on a fine central point by means of a rim of lead, was put into a state of rotation on a small agate cup, at the rate of 600 revolutions in a minute; and a light ring of tinned iron, also finely balanced on a central pivot, was placed immediately over it, at about four inches distance, by means of a thin plate of glass, on which its pivot rested. When the ring of tinned iron began to move slowly on its pivot by the influence of the magnet revolving below, a large mass of *copper*, about *three* inches thick, and consisting of plates a foot square, was carefully interposed between the magnet and the iron ring. The interposition of the copper soon sensibly diminished the motion of the iron disc, and at length *arrested it altogether.* On again withdrawing the copper, the motion of the disc was restored; and the same effects were repeatedly obtained. In this experiment both the magnet and the disc were enclosed by glass shades, and supported on a firm base.

The same effects were produced by a mass of silver and zinc; but when their thickness was considerably diminished by removing the central plates, the motion of the disc was not impeded. A very great thickness of *lead* was necessary to stop the disc, in consequence, as Mr Harris supposes, of its magnetic energy being so much less than that of copper.

CHAP. V.—ON THE INFLUENCE OF HEAT ON MAGNETISM.

Influence of heat on magnetism.

This interesting department of magnetism divides itself into three parts: 1*st*, On the effect of heat on the development of free magnetism; 2*dly*, on the anomalous attraction observed during the bright red and red heats; and, 3*dly*, on the effect of heat on the distribution of magnetism in magnets.

SECT. I.—*On the Effect of Heat on the development of Magnetism in Cast and Malleable Iron.*

In cast and malleable iron.

In the course of his experiments on the relative magnetic powers of different kinds of iron and steel, already given in the history of magnetism, Mr Barlow was led to the conclusion, that the harder the metal was, the less it exhibited of a magnetic quality; a result which was highly favourable to the hypothesis, that the cohesive power of hardened steel not only prevented the entire development of its magnetism, but also the re-combination of the two kinds of magnetism when they were displaced by the action of a powerful magnet. With the view of establishing this hypothesis, Mr Barlow found it necessary to ascertain whether these different kinds of iron and steel would exhibit the same magnetic powers when reduced to the same degree of softness, which could only be done by heating them in a furnace, and trying their magnetic qualities in that state.

Having procured a bar of soft iron twenty-five inches long and an inch and a quarter square, and a cast-iron one of nearly the same dimensions, he inclined the bars in the direction of the dip; and having placed a magnetic needle nearly on a level with the upper extremity, and at the distance of six inches from it, he observed the deviations produced by the bars in different states of heat. Thus,

Influence of Heat on Magnetism.

Cast iron	Cold	Mean deviation	21°	30′
Ditto	White heat	Ditto	0	0
Ditto	Blood-red heat	Ditto	62	0
Malleable iron	Cold	Ditto	40	0
Ditto	White heat	Ditto	0	0
Ditto	Blood-red heat	Ditto	55	0

These experiments were often repeated with the same results. It deserves to be remarked as a singular result, that cast iron is decidedly inferior in its action when cold, and when hot possesses a superior power to malleable iron.

Mr Barlow now compared malleable iron with soft and hard shear steel. The bars were twenty-four inches long and an inch and a quarter square, and the following were the results:

Malleable iron	Cold	Mean deviation	15°	10′
Ditto	White heat	Ditto	0	0
Ditto	Blood-red	Ditto	41	11
Soft shear steel	Cold	Ditto	11	0
Ditto	White heat	Ditto	0	0
Ditto	Blood-red	Ditto	48	0
Hard shear steel	Cold	Ditto	8	0
Ditto	White heat	Ditto	0	0
Ditto	Blood-red	Ditto	47	30

These experiments establish the curious fact of the total destruction of the magnetic virtue by a *white heat;* and also the no less important one, that every kind of iron or steel has a greater capacity for developing its magnetism when softened by fire than when cold.

SECT. II.—*On the Anomalous Attraction observed in Cast and Malleable Iron during the Bright Red and Red Heats.*

Anomalous attraction of iron at a red heat.

In pursuing the preceding researches, Mr Barlow was led to observe a remarkable anomaly in the action of the iron at the red heat. When iron brought to a white heat has wholly lost its power, it again acquires, as it passes into the bright red and red, a magnetic power; but, what is truly strange, its power is *attractive* for the south end of the needle; that is, if the *north* pole of the needle was attracted when the iron was cold, the *south* end will be attracted when the iron is at a bright red heat.

In order to investigate this subject thoroughly, Mr Barlow made a very extensive series of experiments with four different bars, each twenty-five inches long and an inch and a quarter square, two of them being of cast and two of malleable iron. He used also other two bars, one of cast and one of malleable iron, of the same dimensions, which were kept as standards to determine the quantity of cold attraction. The time employed in each experiment was a quarter of an hour: the white heat generally continued about *three* minutes when the negative attraction commenced. This attraction lasted about *two* minutes more, when the usual attraction began. This sometimes reached its maximum with great rapidity, but at other times it increased very gradually. The following table contains the results of Mr Barlow's experiments. The letters CB denote the cast-iron bar, and MB the malleable-iron bar; and the sign + indicates when the ordinary attraction of the iron takes place; and — the anomalous or negative attraction.

Influence of Heat on Magnetism.

Table of the Results of Mr Barlow's Experiments on the Effect of Iron on the Compass Needle at different Degrees of Heat.

N. B.—We have omitted the column for white heat, as no effect is ever produced at that temperature.

No.	Description of Bar.	Height and Depth of Centre of Bar from Needle.	Distance of Bar from Needle.	Position of Needle.	Effect when *Cold.*	Effect of *Red Heat.*	Effect at *Blood-Red Heat.*	Remarks.
		Inches.	Inches.					
1	C. B. No. 1.	0·0	6·0	S. 80° W.	+ 0° 0′	— 17° 0′	0° 0′	South end drawn to the bar at red heat.
2	M. B. No. 2.	4·5 below.	6·0	Ditto.	+ 30 0	0 0	+ 45 0	
3	C. B. No. 2.	Ditto.	6·0	Ditto.	+ 18 0	0 0	+ 49 0	
4	M. B. No. 1.	Ditto.	6·0	Ditto.	+ 29 30	— 12 0	+ 44 0	
5	Ditto.	1·3 below.	6·0	Ditto.	Not observed.	0 0	+ 52 0	
6	Ditto.	4·5 below.	6·0	N. 80 W.	Ditto.	— 12 30	+ 70 0	This bar being left standing, it attracted the same three days after.
7	Ditto.	Ditto.	6·0	S. 80 W.	Ditto.	— 12 30	+ 30 0	
8	Ditto.	Ditto.	6·0	Ditto.	Ditto.	0 0	+ 25 0	The needle suspected to touch the box.
9	Ditto.	Ditto.	6·0	Ditto.	Ditto.	— 19 0	+ 30 0	
10	Ditto.	1·0 above.	6·0	Ditto.	Ditto.	— 15 0	+ 4 0	
11	M. B. No. 2.	12·5 below.	8·5	N. 80 W.	+ 29 30	0 0	+ 37 30	Observed at the same time with two compasses.
12	Ditto.	Ditto.	8·5	N. 80 E.	+ 30 0	0 0	+ 41 0	
13	C. B. No. 1.	Ditto.	8·5	N. 80 W.	+ 16 0	0 0	+ 42 30	Ditto.
14	Ditto.	Ditto.	8·5	N. 80 E.	+ 15 30	0 0	+ 47 30	
15	M. B. No. 2.	9·0 below.	8·5	N. 80 W.	+ 28 30	— 1 0	+ 39 30	Ditto.
16	Ditto.	Ditto.	8·5	N. 80 E.	+ 29 30	— 1 30	+ 42 0	
17	C. B. No. 1.	Ditto.	8·5	N. 80 W.	+ 15 45	— 1 30	+ 45 0	Ditto.
18	Ditto.	Ditto.	8·5	N. 80 E.	+ 16 0	— 1 30	+ 49 0	
19	M. B. No. 2.	6·0 below.	8·5	N. 80 W.	+ 25 0	— 3 0	+ 32 30	Ditto.
20	Ditto.	Ditto.	8·5	N. 80 E.	+ 26 0	— 3 30	+ 33 0	
21	C. B. No. 1.	Ditto.	8·5	N. 80 W.	+ 11 30	— 3 30	+ 36 30	Ditto.
22	Ditto.	Ditto.	8·5	N. 80 E.	+ 13 0	Not observed.	+ 36 30	
23	M. B. No. 2.	3·0 below.	6·0	S. 80 E.	+ 8 0	— 21 30	Not observed.	Ditto.
24	Ditto.	Ditto.	6·0	N. 45 W.	Not observed.	— 25 30	+ 25 30	
25	M. B. No. 1.	0·0	6·0	Ditto.	0 0	— 40 0	0 0	North end drawn to the bar at red heat.
26	M. B. No. 2.	1·0 above.	5·3	N. 60 W.	+ 2 0	— 4 30	+ 5 30	Both attractions very gradual.
27	M. B. No. 1.	Ditto.	5·3	Ditto.	Not observed.	— 12 30	+ 5 30	Passed suddenly to 12½°, but returned immediately.
28	M. B. No. 2.	9·0 above.	6·0	N. 85 E.	+ 47 30	— 2 30	+ 60 0	Attractions gradual.
29	M. B. No. 1.	Ditto.	6·0	Ditto.	+ 47 30	— 2 30	+ 60 0	Ditto.
30	M. B. No. 2.	1·0 below.	5·5	N. 45 W.	Not observed.	— 55 0	+ 5 45	Negative attraction rather sudden.
31	M. B. No. 1.	4·5 above.	7·0	N. 75 E.	Ditto.	— 2 30	+ 33 30	Motion of needle very slow.
32	M. B. No. 2.	1·7 below.	5·5	N. 45 W.	Ditto.	+ 100 0	+ 13 30	100° very sudden, returned immediately.
33	M. B. No. 1.	1·7 above.	5·5	Ditto.	Ditto.	— 26 0	+ 13 30	Both attractions gradual.
34	M. B. No. 2.	Ditto.	5·5	Ditto.	Ditto.	+ 30 0	+ 13 30	The same as No. 32; both anomalous.
35	M. B. No. 1.	4·5 above.	6·0	N. 55 E.	Ditto.	— 5 30	+ 35 30	Attractions very gradual.
36	M. B. No. 2.	Ditto.	6·0	Ditto.	Ditto.	— 0 0	+ 35 30	
37	M. B. No. 1.	0·0	4·7	West.	+ 3 30	— 50 0	+ 8 0	Motion regular, but quick.
38	M. B. No. 2.	0·0	4·7	North.	0 0	0 0	0 0	No motion in the needle.

Influence of Heat on Magnetism.

One of the most remarkable results of these experiments is, that the anomalous action of the bar between a bright-red and blood-red heat *increases* as we raise the bar above the needle, and becomes a *maximum* at the centre of the bar; whereas at low temperatures the action of a bar of iron under the very same circumstances goes on diminishing as the bar is raised, and becomes a minimum at the centre. When the needle is placed at the height of the centre of the bar, when heated to produce the anomalous effect, the smallest displacement is sufficient to change the sign and the quantity of the deviation.

Anomalous action of red-hot iron.

Mr Barlow made some experiments with a twenty-four pound ball of iron, but the heat was too intense to allow any very accurate observations to be made. The results, however, were as follow:

Cold attraction	+ 13°	30′	deviation.
Red heat	— 3	30	
White heat	0	0	
Blood-red heat	+ 19	20	

No effect whatever was produced on the needle by heated bars of copper.

In order to explain the singularly anomalous action above described, Mr Barlow supposes, that during the cooling of the bars, the extremities where this cooling is most rapid become magnetic before the rest of the metal, and that there results from this a complex action. He allows, however, that this supposition does not sufficiently explain all the observed phenomena. The explanation given by Professor Kupffer is more satisfactory. In weakly magnetised bars the points of indifference are very near the extremities; but in Mr Barlow's experiment the magnetism communicated to soft iron by the earth being nothing at a bright-red, and reaching its maximum at a blood-red heat, there is probably formed a point of indifference at each extremity of the bar. If this is the case, the raising of the bar places the needle in front of points which are beyond the point of indifference, and which possess a magnetism opposite to that of the extremity itself. At the first epoch of cooling, this opposite magnetism should even increase to a certain point, and the more as we approach the middle of the bar; but in proportion as the magnetism of the bar increases, the point of indifference will approach its middle, and the phenomena of ordinary attraction re-appear.

M. Kupffer's explanation.

SECT. III.—*On the Effects of Heat on the Distribution of Magnetism in Magnets.*

Effect of heat on the distribution of magnetism.

M. Coulomb was the first philosopher who investigated the important subject of the influence of heat on the distribution of magnetism, in needles and magnets.[1] He took a bar of steel 162 millimetres long, fourteen wide, and weighing eighty-two grammes. This bar was brought to a cherry-red heat, about 900°, and cooled slowly in the air, so as to have no temper. It was then magnetised to saturation at the temperature of about 12° Reaumur. In this state the time of making *ten* oscillations was observed. Its temperature was again raised successively so many degrees, and, after being cooled, the time of performing ten oscillations was again measured. The following were the results:

Temperature in degrees of Reaumur.	Time of performing Ten Oscillations.
12°	93″
40	97·5
80	104
211	147
340	215
510	290
680	very great.

Hence it is obvious that the magnetic intensity of the bar diminishes rapidly as its temperature is raised.

From another set of experiments Coulomb concludes that the tempering of a bar previous to its being magnetised has no influence until the heat at which it is tempered becomes about 750°. When the tempering is at 900°, the bar will take double the magnetic force that it did at 12°; the ratio of the time of ten oscillations being 63″ and 93″, the squares of which, to which the magnetic forces are proportional, are nearly as one to two.

After the magnet had received the hardest temper at 950°, it was magnetised to saturation. When it was brought back, by annealing, to lower temperatures, and again magnetised, the effects were as follow:

Temperature.	Time of *Ten* Oscillations of a Bar tempered at 95°.
12°	63″
80	66
214, blue colour	80
410, colour of water	170

Hence we see that the progressive rise of temperature alters the magnetism of the bar much more when it had been first tempered towards 900° and cooled slowly, than when it had been first put into the annealed state.

When in the annealed state the bar is exposed only to temperatures below 500°, it receives its original force by being again magnetised; but in the state of temper it is not so. Each rise of temperature diminishes perceptibly the magnetic force which the bar can receive from being again magnetised. This is shown in the following table:

Annealing Temperature.	Time of performing Ten Oscillations when again magnetised.
12°	63″
214	64·5
410, colour of water	70
900, cherry red	93

The bar, therefore, attained its maximum energy when tempered at 900°. It then performed ten oscillations in 63″. Setting out from this term, the directive force diminished in proportion as the annealing temperature increased. At 900° the bar, magnetised anew to saturation, employed 93″ to make ten oscillations, as in the first experiments, which ought to have been the case, as it was brought back to the same state of perfect annealing from which it was at first taken.

The bars used by Coulomb were about thirty times as long as they were thick, and with such bars similar results were always obtained. But this was not the case with larger bars. Having taken a steel wire 326 millimetres long and four in diameter, he tempered it at 820°, magnetised it to saturation, and determined its directive force. He repeated the same operation after having annealed it at different temperatures, and the following were the results:

Annealing Temperature.	Time of Ten Oscillations.
12°, temperature of atmosphere	89″
320, colour of water	75
450, deep red	68
530, less deep red	70
900, bright cherry red	76

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[1] Biot, *Traité de Physique*, tom. iii. p. 106.

Here the hard temper gives the weakest directive force, as we have already seen in the preceding experiments. The maximum effect takes place when the wire is annealed at about 450°, and this result is a general one for all wires and plates whose length is very great relative to their width.

This result seems to be connected with a particular mode of distribution of free magnetism. In bars whose length does not exceed thirty times their diameter, there is never more than one magnetic centre, which is in the middle of the bar. But when the ratio of the length to the breadth is greater than this, magnetising it produces always three centres, one in the middle of the bar, and the other two at equal distances from its extremities. This effect is shown in fig. 30, and in fig. 31. The effect of placing such a magnet in iron filings is shown in fig. 31; and in fig. 30 the curve of the intensities is seen to cross the axis between the centre C and the poles A, B, the two new centres being at C′ and C″.

Fig. 30.

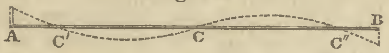
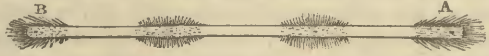


Fig. 31.



M. Coulomb found that the distance C′ A, C″ B of the two new centres from the extremities of the magnet varies with the temper; and the annealing heat is shown by the following results obtained with a wire-magnet 326 millimetres long:—

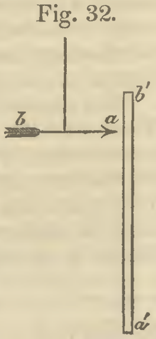
	Time of Ten Oscillations.	Distances of the Centres C′, C″ from the Centre C, the Middle of the Magnet. C′.	C″.
Hard temper	89	98	98
Annealed at the colour of water	75	63	63
Ditto at dark-red heat	68	43	43
Ditto at cherry red	76	0	0

In proportion as the annealing heat increases, the two centres C′, C″ approach each other, and are re-united with the centre C at a cherry-red heat. This last result is very important in the construction of compass-needles. Coulomb regards the *dark red* as the best annealing heat for needles or bars whose length exceeds thirty times their thickness, and the state of hard temper for those where the ratio between the length and the thickness is less.

It is extremely probable, as M. Biot supposes, that when magnets are larger in proportion to their thickness than those used in the preceding experiments, a greater number of centres will be produced, were it from no other cause than the re-action of the plate upon itself.

In examining the influence of temperature on magnets, Professor Kupffer began by examining the effect of heat in altering the distribution of magnetism. For this purpose he took a parallelopiped of tempered steel, 503 millimetres long, 15½ wide, and 5 thick, and having magnetised it to saturation, he heated it, and allowing it to cool slowly, he submitted it to examination. The magnet was placed vertically, as at *a′ b′*, and a needle suspended by a silk fibre was made to oscillate before any point *ab*, in order to determine the intensity of magnetism at that point. In this way he obtained the following results:—

Fig. 32.



Influence of Heat on Magnetism.

M. Kupffer's experimnts.

Distance *ab′* in Millimetres.	Magnet not heated. Magnetic Force.	Same Magnet heated to 80°, and examined after cooling. Magnetic Force.
156	0·5569	0·4376
136·5	0·7374	0·5765
116·5	0·9455	0·7280
96·5	1·1862	0·8897
76·5	1·4311	1·0559
56·5	1·6518	1·1929

Hence it appears that the bar heated to 80° had not only lost much of its magnetic virtue, but that this loss was not uniform along the whole length of the bar, being greater towards the extremities *a′*, *b′* than towards the middle. This may be easily seen by dividing the forces in columns 2 and 3 by one another, when it will appear that the quotients are greater for points nearest *a′* and *b′*.

M. Kupffer next studied the changes which take place in the forces of a magnetic needle when its temperature is increasing, the heat being kept constant during the time of each experiment. He used a cylindrical needle of fused steel, 0·57 millimetre long, and 2·395 grammes in weight. The temperature increased from 8½° to 18°, and the deviation of 300 oscillations varied from 777½ to 781, which shows, as Coulomb had previously observed, that the magnetic force diminished as the temperature increased. By another series of experiments, M. Kupffer has shown, that the diurnal variations of the needle did not at all affect these results.

In order to determine the law of the decrease of the magnetic forces at temperatures above 30°, he made a needle oscillate above a newly magnetised bar 0·5 millimetre long, the opposite poles looking to each other, and he raised the temperature of the bar from 13° to 80°, by means of hot water. At 13°, the needle, when by itself, performed 300 oscillations in 762″, and in presence of the magnet it lost only 429″. When brought to the temperatures in the table, and then cooled, the oscillations of the needle were observed.

Temperature of the Magnet.	Duration of 300 Oscillations.
13°	429
80	476
21	464½
13	463
11	462½

Hence it appears that the magnetic force diminishes with heat, and that a magnet at the temperature of 13°, when heated to 80°, and then cooled to 13°, does not resume its first magnetic state, which is diminished. The cause of this is, that in cooling slowly the bar loses a part of its temper, and consequently a part of its free magnetism.

From these observations M. Kupffer deduces the following formulæ, which represent with great accuracy the influence of temperature, viz.

$$x = \frac{n}{\sqrt{c + \mathrm{F}}}$$

$$x' = \frac{n}{\sqrt{\left(c + \mathrm{F} - \frac{(1-q)^{\mathrm{F}}}{67}\right)(t - 13)}},$$

where c is the force exerted by the earth on the oscillating needle.

x, the number of seconds in which n oscillations are made.

F, the force exerted by the bar at the same temperature.

x', the number of seconds which the same needle employs at the temperature t.

Influence of Heat on Magnetism.

p, the intensity of the magnetic force of the bar at 13°; and

q, the intensity of the same force at 80°.

M. Kupffer proceeded to examine the effects which the heating of only one pole of a magnet produced upon the distribution of its magnetism. With this view he placed a magnet parallel to a needle suspended horizontally, the dissimilar poles being placed opposite to each other. The needle will not remain in the magnetic meridian unless its neutral point and that of the bar are in the same line perpendicular to the needle. This position may be found by a few trials. When by shifting the magnet its neutral point approaches one of the poles of the needle, and always in the same direction, this pole will be repelled, because the opposite pole of the needle is more strongly attracted by the corresponding pole of the magnet, which is brought near it, while the other is removed from it.

Let us now heat the north pole of the magnet; the south pole of the needle opposite to it will be soon attracted. Hence it is clear that the point of indifference, or neutral point, has receded from the heated pole, or from the pole whose magnetic intensity is diminished, which agrees with the law of Coulomb. The following results were obtained with a magnet 0·5 millimetre long, the needle being placed in the magnetic meridian :—

Temperature of the extremity of the Bar.	Duration of 100 Oscillations.
0° Reaumur.	275·5 seconds.
13	276
40	278
56	279·5
15	277·5
11	277

When the magnet had cooled slowly, the needle returned gradually to its first position; but it never recovered it entirely. By the earth's action only, the needle performed 50 oscillations in 207″.

When a bar of soft iron was substituted for the magnet, and placed in the magnetic meridian, it was magnetised by the action of the earth. When one of its extremities was heated, the pole of the needle next it was *attracted* instead of *repelled*, the neutral point having *approached* to the heated extremity, in place of *receding* from it as formerly. Hence the magnetic force of the iron was *increased* by heat.

Mr Christie's experiments.

In examining the diurnal deviations of the needle when under the influence of magnets, Mr Christie conceived that the deviations might be partly the effect of changes in the temperature of the magnets; and he therefore undertook a series of experiments to determine the precise effects of changes of temperature on magnets. By a peculiar apparatus and a method of observation which our limits will not allow us to introduce, he obtained the following results :—

Mean Temperature of the Magnets. Fahr.	Difference of Heats in successive Observations.	Magnetic Intensity.	Variation of Intensity for 1° of Fahr.
62°·05	— 3°·00	212·5620	0°·1268
59 ·05	+ 18 ·60	212·9423	0 ·1247
77 ·65	— 3 ·65	210·6228	0 ·1004
74 ·00	— 3 ·35	210·9892	0 ·1279
70 ·65	— 3 ·50	211·4178	0 ·1193
67 ·15	— 3 ·35	211·8353	0 ·1138
63 ·80	— 1 ·75	212·2167	
62 ·05		212·4640	0 ·1413

By discussing these results, Mr Christie concludes that 0·1226 is the mean variation of the intensity of the magnets, from a change in their temperature of 1° between the temperatures of 59°·05 and 77°·65. Taking the case where the intensity at 60° was 218, the change for 1° was 0·123; and supposing the intensity to be 1, each degree will produce a diminution of 0·000564.

Action of Simple Iron Bodies on the Magnetic Needle.

From a number of experiments made with a balance of torsion, the needle being suspended by a brass wire $\frac{1}{450}$th of an inch in diameter, Mr Christie ascertained the following facts:

1. Beginning with — 3° of Fahrenheit, up to 127°, the intensity of magnets decreased as their temperature increased.

2. With a certain increment of temperature the decrement of intensity is not constant at all temperatures, but increases as the temperature increases.

3. From a temperature of about 80°, the intensity decreases very rapidly as the temperature increases; so that if, up to this temperature, the differences of the decrements are nearly constant, the differences in the decrements also increase.

4. Beyond the temperature of 100° a portion of the power of the magnet is permanently destroyed.

5. On a change of temperature, the most considerable portion of the effect on the intensity of the magnet is produced instantaneously, showing that the magnetic power resides on or very near the surface.

6. The effects produced on soft iron by changes of temperature are directly the reverse of those produced on a magnet; an increase of temperature causing an increase in the magnetic power of the iron. This was observed between the temperatures 50° and 100° Fahr. Mr Christie regards this fact as a strong argument against the hypothesis, that the action of iron upon the needle arises from the polarity which it receives from the earth.[1]

CHAP. VI.—ON THE ACTION OF SIMPLE IRON BODIES ON THE MAGNETIC NEEDLE.

Action of simple iron bodies on the needle.

Mr Barlow undertook the interesting experiments which we are about to describe, with the view of discovering some method of correcting the local attraction of a ship's guns and other iron on the compass-needle.

His attention was first directed to the action of solid spheres and spherical shells of iron; but he afterwards applied the principles to which he was led, to the action of bars and plates of simple iron, and to irregular masses. We shall therefore lay before our readers, in three separate sections, the results of his experiments and theoretical investigations respecting these two forms of unmagnetised iron.

SECT. I.—*On the Action of Spheres and Spherical Shells of Iron on the Magnetic Needle.*

Action of spheres on the needle.

The earliest experiments of Mr Barlow, by which he was led to some of the properties of iron spheres, were made in an imperfect manner; but the phenomena were such as to induce him to construct an apparatus capable of affording him the most accurate measures of the deviation of the needle.

The apparatus which he finally employed is shown in Plate CCCXXV. fig. 6. It consists of a large and steady round table TT, having its surface horizontal. The points of the compass are laid down on its upper face. In its centre is a hole $18\frac{1}{4}$ inches wide, for receiving an eighteen-inch or smaller iron shell or ball B, which is suspended above it by pulleys *pp*, which allow the observer to raise lower it at pleasure. When a diameter of this table is ought into the magnetic meridian, Mr Barlow found, at in whatever part of the table a compass-needle was aced, except in the meridian, the *south* end of the needle as drawn to the ball when the latter was wholly above e table, as in the figure. The attraction increases as e ball descends, till at a certain point it is a maximum, d then decreases again towards zero as the ball de- ends farther. Hence it is clear, that there is all round e ball a position where the attraction is zero; and it was sily observed that these points lay in a plane inclined to e horizon. In this way Mr Barlow established his fun- amental principle, that

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[1] See *Philosophical Transactions*, 1825, p. 1–65.

In every ball or shell of plain unmagnetised iron there ists a plane of no attraction, or a plane in which the iron oduces no disturbance on the needle, and which plane in- ines from north to south (magnetic), forming with the ho- zon an angle equal to the complement of the dip.

This line on the surface of the ball may be called the agnetic equator; and, taking the meridian which passes rough the east and west points as the first, Mr Barlow able to designate every part of his iron sphere by the agnetic longitude and latitude of that point.

Mr Barlow therefore proceeded to determine whether e quantity and deviation at any point could be expressed any function of the latitude and longitude of that point, en the mass of the ball and the distance of the needle m it were constant. From these experiments, which it unnecessary to detail, he found,

That the tangent of the deviation of the needle is propor- nal to the rectangle of the sine and cosine of the latitude, to the sine of the double latitude.

By observing the deviations throughout a great circle in ich the longitude was constant, and also in a circle in ich the latitude and longitude were variable, he found e following law,—

That the tangent of the deviation of the needle is nearly oportional to the sine of the double latitude multiplied by e cosine of the longitude.

By comparing the constant numbers obtained on the eceding principles at different distances *from the centre the sphere*, Mr Barlow found,

That the tangent of the deviation is inversely proportional the cube of the distance.

The remaining object of Mr Barlow's inquiry was a very eresting one, namely, to determine the law of the de- tion as dependent on the mass of the iron ball by the tion of which it was produced. The result was equally w and unexpected. He found,

That the tangent of the deviation was directly proportional the cube of the diameter of the ball or shell; but that it is ll wholly independent of the mass, being the same in quan- y whatever be the thickness of the metal, provided only t it exceed one twentieth of an inch.

Hence it follows, *that the entire magnetic power of an n sphere resides on the surface, and is independent of the idity.*

Mr Barlow was so much surprised at this result, that constructed a ten-inch shell of tin plate and another iron plate, the former weighing forty-three ounces and e latter forty-five ounces, and he found that the power neither was so great as that of the solid ball of the same meter, but approached to it in the ratio of two to three. the thickness of the iron in these shells was at an ave- ge about one thirtieth of an inch, Mr Barlow concluded at the magnetic fluid requires a certain thickness of tal, exceeding one thirtieth of an inch, in order effec- lly to develope itself, and act with its maximum energy.

This important result was some time afterwards veri- d by Captain Kater, with three cylinders, one of soft n, and one tenth of an inch thick; another of what is called chest-plate, 0·185 of an inch thick; and the third solid. The deviations produced by these three cylinders, when reduced to the same extent of surface, were 141, 184, and 187, thus proving that the cylinder whose thickness was only 0·185, or between one fifth and one sixth of an inch thick, had the same magnetic power as a solid cylinder of iron. The distribution of magnetism on the surface of magnetic bodies presents us with another interesting analogy between the magnetic and electric fluids; and it deserves our particular notice, that in the results obtained by Mr Barlow, the action of the sphere is related to the centre of its mass, and not to the poles of its magnetic equator.

Action of Simple Iron Bodies on the Magnetic Needle.

Professor Barlow on the action of iron spheres.

Mr Barlow next proceeds to the investigation of analytical formulæ which shall exhibit the action of iron spheres upon a magnetic needle. In this inquiry he sets out with the established experimental fact already mentioned, *that the entire magnetic power of an iron sphere resides on the surface, and is independent of the solidity;* and he proceeds on the following hypothesis.

1. Magnetic phenomena are due to the existence of two fluids in a greater or less degree of combination, and such that the particles of the same fluid repel, and those of an opposite nature attract, each other.

2. These fluids in iron bodies exist naturally in a state of combination and equilibrium till that state is disturbed by some exciting cause.

3. But if a body already magnetic, *i. e.* one in which the fluids are held in a state of separation, be brought within the vicinity of a mass of iron, such as is supposed above, the concentrated action of each fluid in the magnetised body will act upon the latent fluids in the quiescent body, by repelling those of the same, and attracting those of the contrary kind, and thus impress upon the latter a temporary state of magnetic action, which will remain only while the two bodies maintain their respective situations.

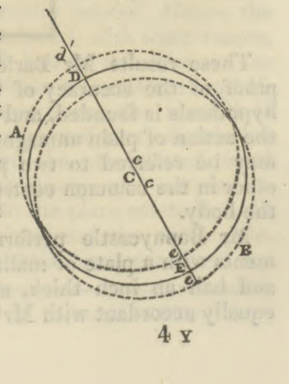
4. The quantity of action impressed upon the iron body will depend, 1*st*, upon the intensity of the exciting magnet; 2*dly*, upon the capacity of the quiescent body for magnetism, or the quantity of those fluids contained in it; and, 3*dly*, upon the cohesive power of the iron; which latter quality determines the depth to which the exciting magnet is able to disengage the two fluids.

The above embraces every case, namely, of any magnet, natural or artificial, developing the magnetism in any given iron body; but the displacement occasioned by the magnetic action of the earth, or spheres of iron, is more limited in its results, and more susceptible of correct mathematical investigation.

5. In this case, for instance, we may suppose the action to take place on every particle of the mass in lines parallel to each other, and corresponding in direction with the dipping needle; also, that every particle is at the same distance from the centre of the disturbing force, and consequently that the displacement in each particle is equal also.

6. For the sake of illustration, let ABED represent a sphere of iron in its non-magnetic or quiescent state, and let CM be the line on which the terrestrial magnetism is exerted from a centre of action M, which is at such a distance that the diameter of the sphere is inconsiderable in comparison with it; then every particle on its surface, and to a certain distance within it, will be acted upon by equal powers, and in directions parallel to each other, whereby the fluids

Fig. 33.



Action of Simple Iron Bodies on the Magnetic Needle.

in the quiescent body, before in a state of combination, will be separated in each particle; and the two fluids may now therefore be conceived to form two spherical shells AeBd, Ae′Bd′, whose centres of action will be c, c', their distances from each other being greater or less, according to the circumstances stated in No. 4.

Professor Barlow on the action of iron spheres.

7. Therefore, in computing the action of such a mass of iron, in its temporary state of magnetism, upon a distant particle of magnetic fluid, Mr Barlow refers it to these centres, and assumes that the law of action in this, as in other cases of emanating forces, is inversely as the squares of the distance.

By means of this hypothesis Mr Barlow arrives at the following formula for the deviation Δ of a horizontal needle.

$$\text{Tan. } 7\,\Delta = \frac{C}{M}\cdot\frac{3r^2}{2d^3 \cos.\,\delta}\,(2\lambda\cdot\cos.\,l),$$

where $r =$ radius of the iron spheres;

$d =$ the distance of the needle from the centre of the spheres;

$\lambda =$ the complement of the magnetic latitude;

$l =$ the complement of the magnetic longitude;

$\delta =$ the dip of the needle; and

$\frac{C}{M} = 1{\cdot}0539$ a constant quantity for cast-iron balls and shells, of every diameter, and for all distances and positions.

From this formula it necessarily follows,—

1. That though the development of the magnetism of the spheres takes place by the hypothesis only at the surface, yet the effect, as shown by the tangent of the deviation, is proportional to the cube of the diameter.

2. That the tangent of deviation is inversely as the cube of the distance.

3. That the tangent of the deviation is proportional to the sine of the double latitude and cosine of the longitude, the latter being extended from the east and west points.

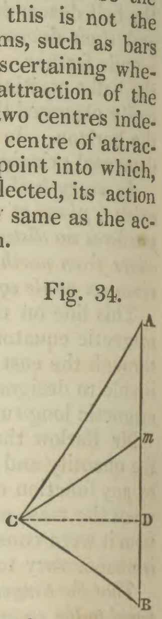
These are the very laws which Mr Barlow had deduced from experiment, and he has established the correctness of his formula by comparing it with a great body of experiments made by himself and Mr Christie, and also with observations on the dipping needle.

SECT. II.—*On the Action of Simple Iron Bars and Plates on the Magnetic Needle.*

Action of Simple Iron Bodies on the Magnetic Needle.

As spherical bodies possess the peculiar property of having their centre of attraction in the centre of the mass, the former becomes a fixed point, whatever be the distance of the magnetic needle. As this is not the case, however, with bodies of other forms, such as bars and plates, Mr Barlow was desirous of ascertaining whether, in these cases also, the magnetic attraction of the body could be referred to the action of two centres indefinitely near to each other in the general centre of attraction of the surface of the body, viz. that point into which, if all the matter of the surface were collected, its action on the centre of the needle would be the same as the action of the whole body in its natural form.

Fig. 34.



In pursuance of this plan, he supposes AB to be a bar of iron, and C the place of the needle, and, letting CD fall perpendicular on AB, he joins AC, mC, BC. He then finds the following expression for the deviation, $\tan.\,\Delta = A\,\frac{mn \cos.\,l}{(m^2+n^2)^{\frac{1}{4}}}$, A being a constant quantity, l the longitude, m the force in the direction DC, and n the force in DA. In the experiments with which Mr Barlow proposed to compare this formula, the needle was placed due east and west of the bar, the longitude of its position was zero, and hence $\cos.\,l = 1$. The formula, therefore, becomes

$$\tan.\,\Delta = A\,\frac{mn}{(m^2+n^2)^{\frac{1}{4}}} \text{ or } \tan.\,\Delta\cdot\frac{(m^2+n^2)^{\frac{1}{4}}}{mn} = A,$$

whatever may be the distance of the needle or its position, provided its longitude be zero. The following experiments were made by Mr Charles Bonnycastle, with a bar twenty-four inches long and an inch and a quarter square, inclined in the direction of the dipping needle. The magnetic needle was placed to the east and west of the bar, first opposite to its centre m, and then at every three inches from the centre to the extremities, at the distance of twelve and sixteen inches from the axis of the bar. The following were the results.

Mr Bonnycastle's experiments.

Distance of Compass from Bar in inches.	Distance below Centre.	Observed Deviation.	Value of $\frac{mn}{(m^2+n^2)\frac{1}{4}}$	Values of A.
16	3	2° 20′	·00240	17·03
16	6	4 25	·00438	17·62
16	9	5 45	·00563	17·88
16	12	6 0	·00596	17·63
12	3	5 20	·00484	19·28
12	6	10 0	·00899	19·62
12	9	12 0	·01152	18·45
12	12	11 30	·01160	17·54
				Mean....18·13

These results Mr Barlow justly regards as a further proof of the accuracy of the principles upon which his hypothesis is founded, and of his general deduction that the action of plain unmagnetised iron on a compass needle may be referred to two poles indefinitely near to each other in the common centre of attraction of the surface of the body.

Mr Bonnycastle performed another series of experiments with a plate of malleable iron twelve inches square and half an inch thick, and he obtained results almost equally accordant with Mr Barlow's hypothesis.

SECT. III.—*On the Action of Irregular Masses of Iron on the Magnetic Needle.*

Action of irregular masses of iron.

Mr Barlow was next desirous of ascertaining if the same law which applied to spheres, bars, and plates, was true in irregular masses of iron, such as a 24-pounder gun; an experiment peculiarly applicable to the object he had in view. He found that the plane of no attraction existed in the most irregular masses of iron, and the agreement between the observed deviations produced by the gun, and those calculated by his formula, was such as to satisfy him that the same laws applied to irregular as to regular masses of iron; and he was thus furnished with the means of computing the local attraction of a ship's guns upon the compass under all circumstances, and in all parts of the world.

These views have been strikingly confirmed by several ingenious observations, made, without knowing of Mr Barlow's labours, by Mr Lecount of the navy, with bars, handspikes, mast rings, and various other iron bodies, from which he concluded "that a plane or circle held east and west (magnetic), and at right angles to the direction of the dipping needle, divides the north from the south magnetic effluvia, each lying on that side to which the dipping needle points; and by referring the position of all iron bodies to this plane, the plane of section shall divide the two into north and south polarity, provided it be of uniform thickness, or, if not, the section must be drawn through its centre of (gravity) attraction."[1]

CHAP. VII.—ON THE INFLUENCE OF MAGNETISM ON CHEMICAL ACTION.

Influence of Magnetism on Chemical Action.

An opinion had long prevailed among philosophers that the phenomena of magnetism and electricity had a similar origin; and hence various observers had been led, previous to the discovery of electro-magnetism by Oersted, to inquire if any actions of a chemical nature could be produced by magnetism.

The German philosopher Ritter was the earliest and the most active of these inquirers. He maintained that a magnetic wire, combined with another wire not magnetised, produced contractions in a frog, the south pole of the wire-magnet producing stronger contractions than the unmagnetised wire; and as he had constantly observed that the metals most susceptible of excitation excited the strongest contractions, he concluded that the south pole of a magnet has a greater affinity for oxygen than simple iron, and the north pole a less affinity. Hence he was led to confirm these views by means of several chemical reagents. He placed a magnetised wire upon pieces of glass in an earthenware dish containing weak nitric acid, when he found that the south pole was more corroded by the acid than the other, and was soon encircled with a deposition of oxygen greater than that at the other pole. In another experiment he took two flasks filled with tincture of turnsol, in one of which he placed the two south poles of two wire-magnets, and in the other the north poles of two similar magnets. In the last flask the oxidation of the wires was much greater than in the first.

The difference in the oxidation of the south pole was exhibited by Ritter in another way. He took three small and equal bottles filled either with pure or slightly acidulated water, and having placed in one the south pole of a wire-magnet, in another the north pole, and in the third the extremity of an unmagnetised wire of the same length, he observed that the south pole first began to deposit oxide, the unmagnetised wire next, and the north pole last. In order to exclude the access of air, the surface of the water should be covered with very fresh oil of almonds; and as light accelerates oxidation, none of the bottles should be more exposed to the sun than the rest. In support of this last observation, Ritter exposed two iron wires to the sun when placed in water, and having covered one of the bottles with black paper, he found that the wire in the uncovered bottle was oxidated more rapidly than the other. Ritter repeated the preceding experiment with the three bottles containing an infusion of litmus in place of acidulated water. The south pole reddened the infusion most, the unmagnetic wire less, and the north pole least of all. A week is required to produce a distinct effect; and in order even to effect this, Ritter found it necessary to add as much acetic acid as would incline the infusion to red without completely changing its colour.

Experiments of Ritter.

The following experiment of Ritter, if correctly repeated, establishes the same result. We shall give it nearly in his own words: "Sixteen magnetic wires, of equal size and power, were placed in six vessels, all equally full of a mixture of one part nitric acid and thirty-six parts water, in the following manner: In the first glass were placed two wires, one with the north pole immersed in the fluid, the other with the south, and not more than half a line asunder; in the second, the same, but the wires an inch and three fourths apart; in the third and fourth were each three wires, with the south poles of all immersed, but their distances in the two glasses different, as in the first and second; in the fifth and sixth were wires similarly arranged, but with the north poles immersed. Different quantities of oxide were gradually deposited, and, to express the whole in a few words, we will call the south pole S, the north pole N, their greater distance g, and their less p, and we will express the order of oxidations as follows: $\mathrm{SN}g > \mathrm{SN}p > 3\mathrm{S}p > 3\mathrm{S}g > 3\mathrm{N}p > 3\mathrm{N}g$. On the nineteenth day it was observed that the loss of fluid by evaporation had not been equal in all the vessels, but took place in the inverse order of the oxidations. All the magnetic wires were weakened in power; $\mathrm{NS}g$ least, $\mathrm{NS}p$ more; of the wires $3\mathrm{S}p$, two had lost less power than the third; and in like manner $3\mathrm{S}g$, $3\mathrm{N}p$, $3\mathrm{N}g$, had each two left more powerful than the third; the strongest were equal to $\mathrm{NS}g$."

Experiments of Muschman,

The next experiments on this subject were made by M. Muschman, professor of chemistry in the university of Christiania, who endeavoured to ascertain the effect of the earth's magnetism on the precipitation of silver. In his chemical course in 1817, when he was desirous of explaining the chemical theory of the tree of Diana, he took a tube like a syphon, and poured mercury into it, which accordingly occupied the lower part of the two branches: above the mercury he poured a strong solution of nitrate of silver. He then placed the two branches of the syphon so that the plane passing through them was in the magnetic meridian, and after standing a few seconds, the silver began to precipitate itself with its natural lustre; but it accumulated itself particularly in the northern branch of the syphon, while that which was less copiously precipitated in the other branch had a less brilliant lustre, and was mixed with the mercurial salt deposited from the solution. M. Muschman and Professor Hansteen repeated this experiment in an improved form with the very same result. On this occasion they used simultaneously two syphons prepared in the same manner, the one being placed in the direction of *north* and *south*, and the other in that of *east* and *west*. The silver began to precipitate itself in the direction of *north* and *south*, and it particularly raised itself in the *north* branch with a lustre more brilliant than in the *south* one; whereas in the syphon whose plane lay *east* and *west*, *no change had taken place even at the end of twelve hours.* Hence the two Norwegian philosophers concluded, with some reason, that the magnetism of the earth had an influence on the precipitation of silver from a solution of its nitrate; and M. Muschman inferred, from the experiment, the identity of galvanism and magnetism. He regarded every dissolution as the result of a galvanic effect, the precipitated metal carrying off the electricity set at liberty, and carrying itself, in order to be disengaged, to the place where it could find the opposite electricity, which was the north pole. M. Muschman considered this hypothesis confirmed by

and Hansteen.

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[1] Lecount *on the Magnetic Properties of Iron Bodies.*

the geological fact, that at Königsberg silver was found in the metallic form, stretching from north to south; and the presence of the silver is always indicated by a certain quantity of pyrites and blendes. Hence he conceived that the silver had been insensibly united to sulphur, and that by the effect of the earth's magnetism alone it had been carried towards the copper and the zinc.

Experiments of Fresnel;

M. Fresnel made a series of experiments with the view of decomposing water by the magnet. He proposed to produce an electric current in an electro-magnetic helix enclosing a bar-magnet covered with silk. The two ends of the wire were plunged in slightly acidulated water, and he observed very decided effects; but there were so many anomalies in the result, which he could not explain, that he abandoned the inquiry. He was particularly struck with the fact, that the wire which should be the positive one was strongly oxidated, whilst the other extremity preserved its metallic lustre during a whole week. The negative extremity was covered with a saline deposite, which he conjectured to be sulphate of lime, and which he supposed had protected the wire from oxidation.

of Erdman.

M. Erdman, after a very elaborate inquiry into the effects of magnets as chemical agents, came to the conclusion that the observed phenomena were due to the influence of other causes, which had not been sufficiently guarded against.

A curious fact, connected perhaps with the class of phenomena under our observation, was noticed by M. Lebaillif. He observed that the poles of a magnetic needle delicately suspended were repelled by pieces of antimony or bismuth that were brought near them.

CHAP. VIII.—ON THE LAWS OF THE MAGNETIC FORCES, THE MUTUAL ACTION OF MAGNETS, AND MAGNETIC CURVES.

SECT. I.—*On the Law of the Magnetic Force.*

Law of the magnetic force.

In our history of magnetism we have given very full details of the various attempts which were made by philosophers to determine the law according to which the intensity of the attractive and repulsive power of magnets varied with the distance at which these forces were exerted. Like all other laws, an approach to the discovery of it had been made by various philosophers; but the merit of its perfect establishment undoubtedly belongs to Dr Robison and Coulomb, the last of whom placed it beyond the reach of doubt. The difficulties which were to be overcome in this inquiry arose from the invariable co-existence of two opposite polarities in each of the two bodies whose mutual action was under examination; and this difficulty was increased from these polarities not being concentrated in particular points, but diffused in an unequal degree over each half of the magnet and the needle.

Researches of Coulomb.

In this delicate inquiry Coulomb employed two methods. In the first he suspended a magnetic needle by a silk fibre, and when it was in the magnetic meridian, he presented to it at different distances another magnetic needle, and determined by observation and calculation the force with which they acted upon each other at these distances. A needle an inch long, weighing seventy grains, and magnetised to saturation, was suspended by a fibre of silk three lines long, and a steel wire magnet twenty-five inches long was placed vertically in the magnetic meridian at different distances, so that its south pole was always ten lines below the northern extremity of the suspended needle. The needle was now made to oscillate when the magnet was at different distances from it, and the following were the number of oscillations in 60″, the number being fifteen when the magnet was removed, and the needle influenced only by the magnetism of the earth.

Distance of a Wire Magnet from the middle of the Needle.	Number of Oscillations in 60″.
4 inches	41
8 ditto	24
16 ditto	17

By means of the formula for the pendulum, in which the forces are in the direct ratio of the square of the number of oscillations performed in the same time, Coulomb has computed their intensity. As all the forces concerned are in the plane of the magnetic meridian, the force which produces the horizontal oscillations depends on the parts of these forces which are decomposed in a horizontal direction. Now Coulomb had demonstrated that the magnetic fluid might be considered as concentrated at a point ten lines from the extremity of the wire-magnet; but as the suspended needle was one inch long, its north pole was attracted at the distance of three and a half inches, and its south pole at the distance of four and a half inches, so that four inches was the mean distance at which, in the first experiment, the lower pole of the wire-magnet exerted its action on the two poles of the needle. In the second experiment the mean distance was eight inches. But as the horizontal force which produces the oscillations is the square of the number performed in 60″, the magnetic force of the earth will be 15^2, and the combined forces of the earth and the wire-magnet will, in the first, second, and third experiments, be 41^2, 24^2, and 17^2, so that the forces which emanate from the wire-magnet will be $41^2 - 15^2$, $24^2 - 15^2$, $17^2 - 15^2$, whence we deduce the following results:

	Mean Distance.	Force depending on the Action of the Wire-magnet.
1*st* experiment	4 inches	$41^2 - 15^2 = 1456$
2*d* experiment	8 ditto	$24^2 - 15^2 = 351$
3*d* experiment	16 ditto	$17^2 - 15^2 = 64$

The distances in the first and second experiments being as one to two, the variation of the force would have been exactly as the squares of these numbers had the force in the second experiment been 364 instead of 351; and the same would have been the case had the force in the second and third experiments been 332 and 83, instead of 351 and 64. This difference, therefore, requires to be investigated. Coulomb has accounted for it, and calculated the correction for these numbers in the following manner. In the experiments the action of the superior pole of the wire-magnet was neglected. The distance of its inferior pole from the centre of the needle was sixteen inches, and the distance of the superior pole from the centre of the needle is nearly $\sqrt{(16^2 + 23^2)}$, so that the force of the former is to that of the latter nearly as 100 to 19. Hence, as the oscillations of the needle are produced by the action of these two poles, which exert their force in opposite directions, the square of the number of oscillations which the single action of the inferior pole of the magnet would produce should be diminished $\frac{19}{100}$ths by the opposite action of the superior pole; so that 64 is only the excess of the real amount of the single action of the lower part of the magnet over $\frac{19}{100}$ths of the number which represents it. The true value will therefore be 79. The true intensities of the forces will, at the distances 4, 8, and 16 inches, be 1456, 351, and 79, or nearly in the inverse ratio of the squares of the distances.

M. Coulomb has in like manner demonstrated, that the repulsive force of similar poles follows the same law of the distance.

Coulomb magnetic balance.

The *second* method employed by Coulomb requires the use of the magnetic balance, which is represented in Plate CCCXXV. figs. 1 and 5, which is a modification of the torsion balance already described in our article on ELECTRICITY. The suspending wire, *ab* fig. 1, carries at its lower extremity a pair of pincers *c*, which holds a stirrup

1, 2, 3, formed of a plate of very light copper. In this stirrup is placed a small piece of card covered with a coat of Spanish wax, on which is impressed the mark of the wire or bar of steel SN to be used, in order that it may always be put in the same position. Under the middle of the stirrup is fixed a vertical plane PP, wholly immersed in a vessel VV of water, the resistance of which may quickly stop the oscillations of the needle or magnet SN in the stirrup. When fitted up for the experiments under our consideration, the apparatus shown in fig. 1 is placed in a square box AB (see fig. 5), three feet wide and eighteen inches high. At the height of nine inches above the bottom is placed a horizontal circle of wood or copper, two feet ten inches in diameter, and divided into degrees. On this box is placed a cross piece CD, which supports at its middle point a tube EF, thirty inches long, and terminating in a torsion micrometer at M. The pincer of this micrometer holds the upper end of a brass wire, to the other extremity of which is adapted a ring of copper intended to carry a steel needle.

Before the commencement of the experiment, the box AB is placed so that the direction of the magnetic meridian passes through the divisions *zero* and 18° of the horizontal circle. The next step is to place in the stirrup a well-magnetised steel needle NS, of a rectangular form, and to adjust the torsion micrometer M, so that the torsion of the wire is nothing when the needle NS is in the magnetic meridian, or that the magnetic meridian passes through the *zero* on the scale of the torsion micrometer. In the direction of the magnetic meridian, a vertical ruler of wood or copper, one or two lines thick, is fixed, so that the end of the needle may come against it when it is in the magnetic meridian.

Coulomb now took two wire-magnets, twenty-four inches long and one and a half inch in diameter, and he placed one of them in the stirrup, as at NS, and he determined the force with which the magnetism of the earth drew it back into the magnetic meridian. For this purpose he twisted the suspending wire *ab* through two circles or circumferences minus 20°, till the needle stopped 20° from the magnetic meridian, so that, considering the forces as nearly proportional to the arcs (when the angle is about 20°), about 35° of torsion were necessary to keep the magnetic needle one degree out of the magnetic meridian. The two circles of torsion *minus* 20° are equal to $2 \times 360° - 20° = 700°$; the degrees of torsion required to keep the needle 20° out of the magnetic meridian, or 700° of torsion, are a measure of the directive force of the needle when 20° out of the magnetic meridian. For any other number of degrees, δ, the degree of torsion necessary to balance the directive force will be $700 \dfrac{\sin. \delta}{\sin. 2°}$, because the directive forces are proportional to the sines of the angles. But at 20° the angles may be substituted for the forces, and we shall have $\dfrac{700\,\delta}{20} = 35\delta$, that is, as we stated above, 35° of torsion will balance the directive force of the needle when one degree out of the magnetic meridian. Coulomb now placed the other similarly magnetised wire vertically in the magnetic meridian, so that if the two wires had been prolonged, they would have met at the distance of *ten* lines from their extremities, the point where the magnetism of each acts as if it were concentrated there. He placed the similar poles of each opposite to each other, and consequently the horizontal needle or wire was repelled out of the magnetic meridian; and it took a position at which the force of repulsion of the vertical needle or wire was balanced by the united forces of torsion and the earth's magnetism, which tended to bring the horizontal wire to rest. The following results were obtained after different trials:

Circles of Torsion given to the Suspending Wire by the Torsion Micrometer.	Observed Angles of Repulsion.
0	24
3	17
8	12

Now, in the first experiment, the angle through which the horizontal wire was repelled was 24°, reckoning from the zero of torsion; and when it rested in this position, it was driven towards the zero by a force of torsion of 24° *plus* the directive force of the earth's magnetism, which being 35° for every 1°, amounts to $24 \times 35° = 840°$. The total repulsive force was therefore $840° + 24° = 864°$.

In the second experiment the torsion micrometer was turned round *three* circles in a direction opposite to the 24° first produced; but notwithstanding this great torsion, the horizontal wire-magnet, repelled by the vertical one, returned only to 17° from the magnetic meridian. The force of torsion was therefore 3 circles $+ 17° = 1097°$; but the directive force for 17° is $17° \times 35° = 595°$, hence we have for the total repulsive force $1097° + 595° = 1692°$.

In the third experiment the torsion micrometer was turned round eight circles, and the wire-magnet stopped at 12° from the magnetic meridian. The force of torsion was therefore 8 circles $+ 12° = 2892°$; but the directive force for 12° is $12° \times 35° = 420$, hence we have for the total repulsive force $2892° + 420 = 3312°$.

As the arcs of repulsion are in these experiments so small, we may safely reckon them equal to their chords, and we obtain the following results:

Distances at which the Repulsive Force is exerted.	Corresponding Repulsive Forces in Degrees of Torsion.
12	3312°
17	1692
24	864

Assuming 3312° as correct, the other numbers ought to have been 1650 and 828 instead of 1692 and 864, if the force varies inversely as the square of the distance. The differences 42° and 36° correspond nearly with a degree of error in the observed position of the moveable steel wire, since the directive force is 35° for every degree of deviation from the magnetic meridian. Such an error is certainly a very small one in experiments of this kind, and we therefore conclude that the attractive and repulsive forces of magnets decrease as the squares of their distances increase.

Had the experiments been made upon magnetic points, such an error would not have existed; but they were made with forces diffused over portions of the wire-magnet of some extent. In the last experiment (M. Biot remarks) "when the two wires were nearest each other, the influence of the points lying near the intersection was more weakened by obliquity than in the other experiment; or, in other words, there were at equal obliquities more points which acted in the greater distances (24 and 17) than in the smaller one (12). But as we did not take this augmentation into account, we ought to find that the repulsive force observed at the smaller distance, being reduced in the ratio of the square of the distance, gives for larger distances repulsive forces a little more feeble than those which were actually observed.

In the first method of observation, Coulomb was obliged to calculate the effect of the distant pole; but in the present method this was unnecessary, as the wire-magnets were two feet long, and the greatest arc of repulsion, viz. 24°, corresponded to a distance of five inches between the repelling poles. The other poles were therefore at least four times more distant than those whose repulsive action was calculated; their direct action was therefore sixteen times weaker, besides being greatly weakened by the extreme obliquity with which it acted. Had the wire-magnets been shorter, the action of all the poles might have been taken into consideration.

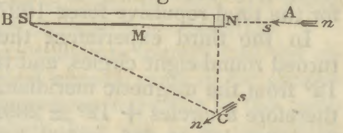
Sect. II.—*On the Mutual Action of Magnets.*

Mutual action of magnets.

We have already seen, from Professor Barlow's experiments on spheres and bars of soft iron, that they act upon needles, whether temporarily or permanently magnetised, as if their magnetism emanated from the centre of their surface, or from two points indefinitely near to each other. This, however, is not the case with permanent magnets, in which the magnetic force is concentrated in poles considerably distant from each other.

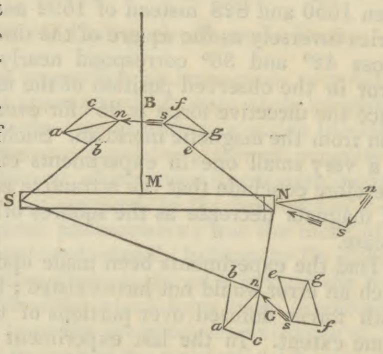
Case 1. When the needle or a small magnet is placed in the line joining the poles of the other magnet.—In considering the mutual action of magnets, we shall suppose the larger one NS to be fixed, and the smaller one *ns* to have the form of a needle, moveable in a horizontal plane round the pivot in its centre A, B, or C. Let the needle then be placed at A, with its centre A in the line S N prolonged, and let us suppose that the magnetic forces emanate from points N, S; *n*, *s*, being the analogous poles of the needle. The north pole N of the magnet *attracts* the *south* pole *s* of the needle with a force inversely proportional to the square of N *s*, and *repels* the *north* pole *n* with a force inversely proportional to the square of N *n*. The effect of both of these forces is to bring *s* as near as possible to N, and to remove *n* as far as possible, that is, to place the needle in the same straight line as N, S, as shown in fig. 35.

Fig. 35.



Case 2. Let the needle, *ns*, be now placed at B, so that its centre B is anywhere in the direction of a right line, MB, perpendicular to the middle M of the magnet. When the centre of the needle is placed above M, it is quite clear that it will stand with its north pole *n* towards the south pole S of the magnet, and its south pole *s* towards the north pole N. When the needle is removed to B, the same thing will happen; S will attract *n* with a force equal to *nb*, while N repels *n* with a force *nc*, a little less than *nb*, on account of the increase of distance. The result of these will be the force *na*, in the diagonal of the parallelogram *ncab*. In the same manner, the pole N will attract *s* with a force *es*, and the pole S will repel *s* with a less force *fs*, the resultant of which is *sg*; but as the poles S, N, are equally strong, and act at equal distances upon the needle, the resulting force *an* must be equal to *gs*, and the needle will remain in that position, which is parallel to the axis SN of the magnet.

Fig. 36.

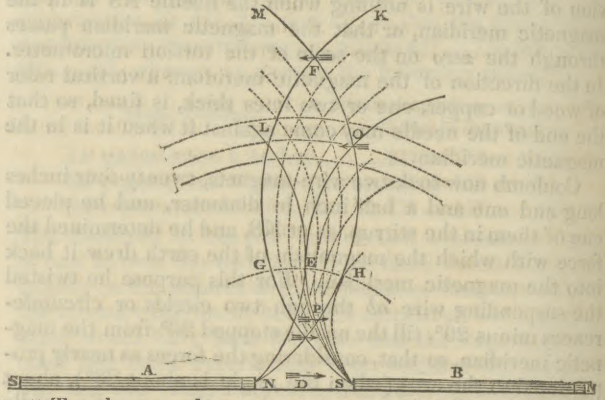


Case 3. When the centre of the needle is placed in an intermediate position, as at C, fig. 36, neither in the axis NS, nor in the perpendicular MB, it will take an intermediate position, which may be thus found. Its north pole *n* is shown in the figure as directed to the centre M of the magnet; but it cannot remain in this position; N repels *n* with a force equal to *nc*, and S attracts it with a force *nb* smaller than *nc*, from the greater distance. The resultant of these is *na*, which is very different from *ns*. For the same reason, the south pole *s*, repelled by S with a force *sf*, and attracted by N with a force *se*, will have a tendency to move in the direction *sg*, nearly equal and opposite to each other; it will therefore take a position *ns*, fig. 36, nearly at right angles to its former position. It will rest therefore in its new position, with its north pole towards N, and its south pole towards S.

If we project upon paper the magnet and the needle placed in different positions, and make the forces of each pole of the magnet on each pole of the needle inversely proportional to the squares of the distances, it will be easy to find the position in which the needle will rest at any distance from the magnet, and at any position of its centre, with regard to the axis of the magnet.

When a needle is exposed to the combined action of two magnets, as shown in the annexed figure, the phenomena, though capable of calculation by the principles already explained, are extremely perplexing and complicated when studied experimentally. Dr Robison, who first discovered and explained these phenomena, has given such an interesting account of them, that we shall make use of his description of the phenomena, leaving the explanation of them to the next section on magnetic curves.

Fig. 37.



“ Two large and strong magnets A and B were placed with their dissimilar poles fronting each other, and about three inches a part. A small needle, supported on a point, was placed between them at D, and it arranged itself in the same manner as the great magnets. Happening to set it off to a good distance on the table, as at F, he was surprised to see it immediately turn round on its pivot, and arrange itself nearly in the opposite direction. Bringing it back to D, restored it to its former position. Carrying it gradually out along DF, perpendicular to NS, he observed it to become sensibly more feeble, vibrating more slowly; and when in a certain point E, it had no polarity whatever towards A and B, but retained any position that was given it. Carrying it farther out, it again acquired polarity to A and B, but in the opposite direction; for it now arranged itself in a position that was parallel to NS, but its north pole was next to N, and its south pole to S.

“This singular appearance naturally excited his attention. The line on which the magnets A and B were placed had been marked on the table, as also the line DF, perpendicular to the former. The point E was now marked as an important one. The experiments were interrupted by a friend coming in, to whom such things were no entertainment. Next day, wishing to repeat them to some friends, the magnets A and B were again laid on the line on which they had been placed the day before, and the needle was placed at E, expecting it to be neutral. But it was found to have a considerable verticity, turning its north pole towards the magnet B; and it required to be taken farther out towards F before it became neutral. While standing there, something chanced to joggle the magnets A and B, and they instantly rushed together. At the same instant the little magnet or needle turned itself briskly, and arranged itself, as it had done the day before, at F, quivering very briskly, and thus showing great verticity. This naturally surprised the beholders; and he now found, that by gradually withdrawing the magnets A and B from each other, the needle became weaker, then became neutral, and then turned round on its pivot, and took the contrary position. It was very amusing to observe how the simply separating the magnets A and B, or bringing them together, made the needle assume such a variety of positions, and degrees of vivacity in each.

"The needle was now put in various situations in respect to the two great magnets; namely, off at a side, and not in the perpendicular DF. In these situations it took an inconceivable variety of positions, which could not be reduced to any rule; and in most of them it required only a motion of one of the great magnets for an inch or two, to make the needle turn briskly round on its pivot, and assume a position nearly opposite to what it had before."

In the preceding observations, the action of the one magnet tended only to change the direction of the other, and this change is clearly produced by the sum of the actions of the two poles of the magnet; for while the one pole tends to draw the one half of the needle into its position of equilibrium, the other pole repels the other half into the same position. The force, therefore, which thus acts upon a needle, is called the *directive force* of a magnet.

The *attractive force* of a magnet is, on the other hand, equal to the difference of the two forces exerted by its poles on the needle; and when the two forces happen to be equal, the attractive force will be nothing, and the needle will have no tendency to approach the magnet, though the directive power of the latter may be very great. This will be understood from fig. 36, when the needle *ns* is at right angles to the axis of the magnet. The attraction of the pole N for *s* is equal to its repulsion of *n*, and these two forces will neutralise each other, so as to prevent any tendency to approach N, even if the needle *ns* were free to do it. On the other hand, in fig. 35, where the needle at C has its south pole *s* more attracted by N than its north pole *n* is repelled by it, the predominance of the attraction would carry the needle towards N if it were at liberty. These views explain the well-known fact, that a needle floated on a piece of cork quickly places itself in the magnetic meridian; but it never will approach the north side of the vessel. In order to explain this fact, Dr Gilbert asserted, that the directive power of a magnet extended much farther than its attractive power; a mistake which arose from his not having observed the effects of the simultaneous action of the four poles of the magnets which acted upon each other.

SECT. III.—*On Magnetic Curves.*

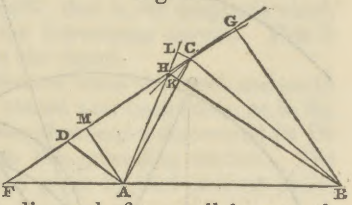
The name of magnetic curves has been given to those curves into which an infinite number of very minute needles would arrange themselves when placed round a magnet, and at liberty to move round an axis. A rude idea of these curves is given by the appearance of iron filings when scattered upon a sheet of paper, and agitated immediately above a magnet.

The action of a magnet upon a needle is greatly simplified when the needle is so small that its two poles may be considered as coincident; in which case the difference between the action of any one pole of a magnet upon them will be infinitely small. When this is the case, the directive force of the magnet upon the small needle must be very considerable, while the attractive force, measured by the difference of the action on the two poles, is nothing. Hence it is that alone which is concerned in the arrangement of minute needles or particles subjected to the action of a magnet.

An investigation of the force of the magnetic curves was made by Professor Playfair, at the request of Professor Robison. Professor Leslie afterwards undertook the same investigation;[1] and Dr Roget[2] has more recently given a more simple demonstration of the two fundamental propositions respecting them, and has described an instrument which he has invented for the mechanical description of these curves. Mr Playfair's investigation, which is sufficiently simple, is as follows; the only change which we have made upon it being the substitution of the second power of the distance for the *m*th power as used by him.

PROP. Two magnetical poles being given in position, the force of each of which is inversely as the square of the distance from it, it is required to find a curve, in any point of which a needle (indefinitely short) being placed, its direction, when at rest, may be a tangent to the curve.

Fig. 38.



"1. Let A and B be the poles of a magnet, C any point in the curve required; then we may suppose the one of these poles to act on the needle only by repulsion, and the other only by attraction, and the direction of the needle when at rest will be the diagonal of a parallelogram, the sides of which represent these forces. Therefore, having joined AC and BC, let AD be drawn parallel to BC, and make $\frac{1}{AC^2} : \frac{1}{BC^2} = AC : AD$; join CD, then CDF will touch the curve in C.

"2. Hence an expression for AF may be obtained; for, by the construction, $AD = \frac{AC^3}{BC^2}$; and since $BC : AD = BF : FA$, and $BC - AD : AD = AB : AF$, we have $AF = \frac{AB \times AC^3}{BC^3 - AC^3}$.

"3. A fluxionary expression for AF may also be found in terms of the angles CAB, ABC. In CF take the indefinitely small part CH; draw AH, BH, and from C draw CL perpendicular to AH, and CK to BH; draw also BG and AM at right angles to FH. Let the angles $CAB = \varphi$ and $CBA = \psi$, then $CAH = \dot{\varphi}$ and $CBH = -\dot{\psi}$; also $CL = AC \times \dot{\varphi}$, and $CK = -BC \times \dot{\psi}$. Now $HC : CL = AC : AM = \frac{AC^2 \times \dot{\varphi}}{HC}$; and for the same reason $BG = -\frac{BC^2 \times \dot{\psi}}{HC}$. Therefore, since $AF : FB = AM : BG$, we have $AF : FB = \frac{AC^2 \times \dot{\varphi}}{HC} : -\frac{BC^2 \times \dot{\psi}}{HC}$, and $AF : AB = \sin.\dot{\psi}^2 \varphi : -\sin.\psi^2 \dot{\varphi} - \sin.\varphi^2 \dot{\psi}$; wherefore, if $AB = a$, $AF = \frac{-a\dot{\varphi}\sin.\dot{\psi}^2}{\dot{\psi}\sin.\varphi^2 + \dot{\varphi}\sin.\psi^2}$.

"4. If this value of AF be put equal to that already found, a fluxionary equation will be obtained, by the inte-

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[1] *Geometrical Analysis.*

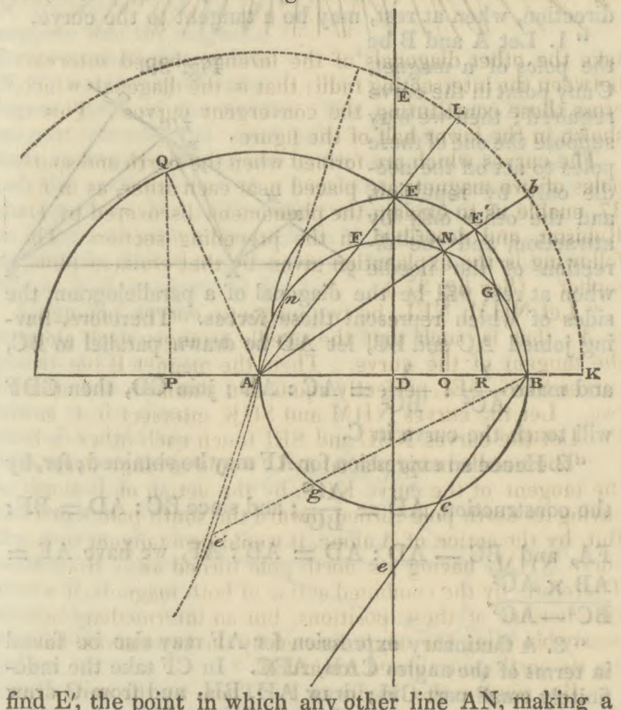
[2] *Journal of the Royal Institution of Great Britain*, vol. i. p. 311. Feb. 1831.

Laws of Magnetic Forces, &c.

gration of which the curve may be constructed. Because $AF = \frac{AB \times AC^3}{BC^3 - AC^3}$; and since $AC = \frac{a \sin. \psi}{\sin. (\varphi + \psi)}$, and $BC = \frac{a \sin. \varphi}{\sin. (\varphi + \psi)}$, we have by substitution $AF = \frac{a \sin. \psi^3}{\sin. \varphi^3 - \sin. \psi^3} = - \frac{a \dot{\varphi} \sin. \psi^2}{\dot{\psi} \sin. \dot{\varphi}^2 + \varphi \sin. \psi^2}$. Hence $\sin. \varphi^2 \times \dot{\psi} \sin. \psi^3 + \dot{\varphi} \sin. \psi^5 = - \sin. \psi^2 \times \dot{\varphi} \sin. \varphi^3 + \varphi \sin. \psi^5$, and therefore $\dot{\psi} \sin. \psi + \dot{\varphi} \sin. \varphi = 0$, and $\cos. \varphi + \cos. \psi = C$."

"5. Hence, if, beside the points A and B, any other point be given in the curve, the whole may be described. For instance, let the point E be given in the curve, and in the line DE which bisects AB at right angles. Describe from the centre A a circle through E, viz. QER, then AD being the cosine of DAE to the radius AE, the sum of the cosines of $\varphi \times \psi$ will be everywhere (to the same radius) $= 2\,AD = AB$. Therefore, to find E′, the point in which any other line AN, making a given angle with AB, meets the curve, draw from N the point in which it meets the circumference of the circle QER, NO perpendicular to AB, so that AO may be the cosine of NAO, and from O toward A take OP = AB, then AP will be the cosine of the angle ABE′; so, to find BE′, draw PQ perpendicular to AP, meeting the circle in Q; join AQ and draw BE′ parallel to AQ, meeting AE′ in E′; the point E′ is in the curve. In this way the other points of the curve may be found.

Fig. 39.

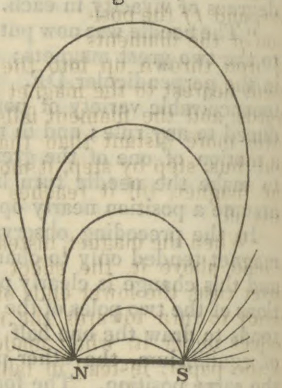


"The curve will pass through B, and will cut AB at an angle of which the cosine = RB. If then E be such, that AE = AB, the curve will cut AB at right angles. If E″ be more remote from A, the curve will make with AB an obtuse angle toward D; in other cases it will make with it an acute angle.

"A construction somewhat more expeditious may be had by describing the semicircle AFB, cutting AE in F, and AE′ in N, and describing a circle round A with the distance AL = 2AF, cutting AE′ in *b*. If BG be applied in the semicircle AFB = N*b*, BG must cut AN in a point E′ of the curve, because AN + BG = 2AF, and AN and GB are cosines of the angles at A and B.

"As the lines AN and BG may be applied either above or below AB, there is another situation of their intersection E′. Thus A*n* being applied above, and B*g* below, the intersection is in *e*′. The curve has a branch extending below A; and if D*e* be made = DE, and B*e* be drawn, it will be an asymptote to this branch. There is a similar branch below B. But these portions of the curve evidently suppose an opposite direction of one of the two magnetic forces, and therefore have no connection with the position of the needle."[1]

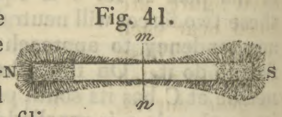
Fig. 40.



The general form of the magnetic curves is shown in fig. 40, where they are seen *converging* to the two poles N, S of the magnet NS, and changing their form with their distance from the magnet.

We have already stated that iron filings, arranged by the action of a powerful magnet, afford the finest experimental illustration of the magnetic curves. The best way to do this is to stretch a sheet of paper tightly over a wooden frame, and place it horizontally immediately above a powerful bar magnet lying on the table. Fine iron filings are now to be shaken through a gauze bag upon the surface of the paper. When the filings are thrown into a state of agitation by gently tapping upon the paper frame, they will dispose themselves into regular lines, stretching from one pole of the magnet to the other, and following the course of the magnetic curves, and exhibiting them beautifully to the eye. This effect is shown in the annexed figure, where N, S are the poles of the magnet NS, *mn* being the mean line where no filings adhere. The same arrangement is also produced when the magnet is held above the paper containing the filings.

Fig. 41.



In the case of induced magnetism, the steel filings arrange themselves in curves round the iron on which the magnetism is induced, as shown in fig. 42, where the small bar of iron is in contact with the north pole N of a magnet, *mn* being the mean line which separates the two opposite actions of the little iron bar. When the little bar of iron is placed at a distance from the magnet N, as in fig. 43, the filings arrange themselves as in that figure, *mn* being the mean line as before.

Fig. 42.

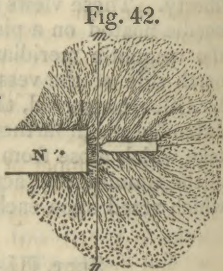
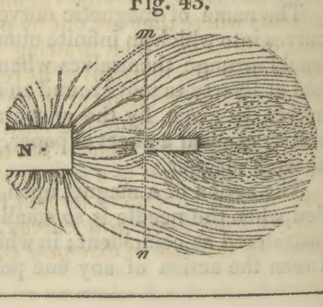


Fig. 43.



Dr Roget has given the following interesting account of the phenomena which take place by continuing to agitate the filings when they are arranged as in fig. 44.

"By continuing to tap upon the paper," says he,

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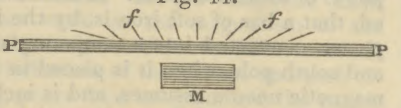
[1] Robison's *Mechanical Philosophy*, vol. iv. p. 350-3.

Laws of Magnetic Forces, &c.

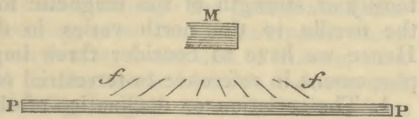
"the filings arrange themselves still more visibly into separate lines; but here a curious and perhaps unlooked-for phenomenon presents itself. The lines gradually move and recede from the magnet, appearing as if they were repelled instead of attracted, as theory would lead us to expect. This arises from the circumstance that each particle of iron, or cluster of particles, is thrown up into the air by the shaking of the paper, and, while unsupported, immediately turns on its centre, and acquires a position more or less oblique to the plane of the paper. This is shown in fig. 44, in which M represents a section of the magnet, PP a section of the paper, and *ff* the position of the filaments of iron thrown up into the air. The end of each filament nearest to the magnet is thus turned a little downwards, and the filament falls upon the paper at a point a little more distant than that which it before occupied; and thus, step by step, it moves farther and farther from the magnet, till it reaches the edge of the paper, and falls off.

Fig. 44.



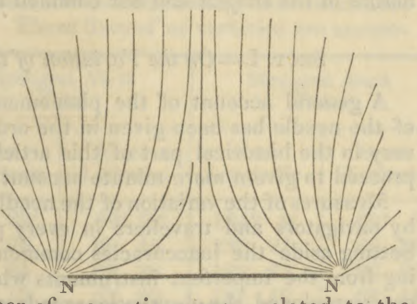
"When the magnet, instead of being beneath the paper, is held above it, the effect is just the reverse. In this latter case, the lower ends of the filaments having a tendency to turn towards the magnet, the filings gradually collect under it, when made to dance by the vibrations of the paper, instead of falling outwards as they did before. This will be seen from fig. 45, where the letters have the same indications as in the preceding figure."[1]

Fig. 45.



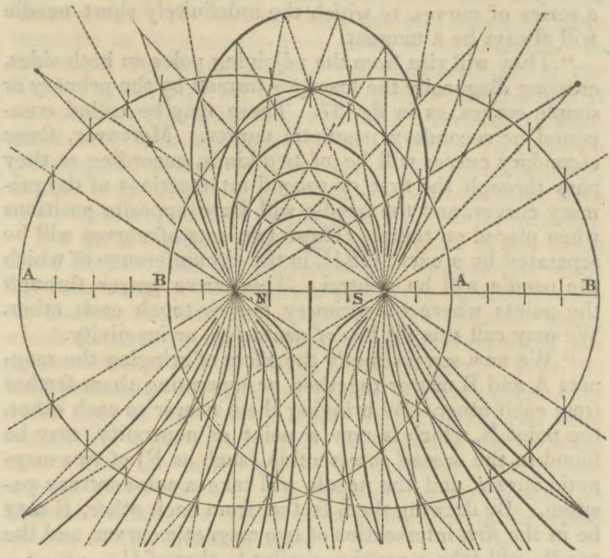
A different set of magnetic curves is produced when two similar poles, for example, two north poles, as shown in the annexed figure, are placed near each other. These curves are called *divergent* curves, and may be exhibited by iron filings like the convergent ones.

Fig. 46.



Dr Roget has given the following expeditious method of delineating a great number of magnetic curves, related to the same distance between two magnetic poles. He describes from each pole N, S, as centres, the equal of circles or semicircles AA, BB, with as large a radius as the paper will allow; and dividing the axis produced till it meets both circles, he marks off, on the circumferences of both circles, the points where they are cut by perpendiculars from these points of division; then drawing radii from the centre of each circle to the divisions of its respective circumferences, the mutual intersections of these radii will give different sets of points indicating the form of the magnetic curves which pass through them. These curves are, in the present case, composed of a succession of diagonals of the lozenge-shaped interstices formed by the intersecting radii, as shown from *convergent* curves in the upper half of the figure. In the case of *divergent* curves in fig. 46, we must take the other diagonals of the lozenge-shaped intervals between the intersecting radii; that is, the diagonals which cross those constituting the convergent curves. This is shown in the lower half of the figure.

Fig. 47.



The curves which are formed when the north and south poles of two magnets are placed near each other, as in fig. 37, enable us to explain the phenomena discovered by Dr Robison, and described in the preceding section. The following is the explanation given by that eminent philosopher. (See fig. 37.)

"Let NHM, NEL, be two magnetic curves, belonging to A; that is, such that the needle arranges itself along the tangent of the curve. Then the magnet B has two curves SGK, SEI, perfectly equal, and similar to the other two. Let the curves NHM and SGK intersect in C and F. Let the curves NEL and SEI touch each other in E.

"The needle being placed at C, would arrange itself in the tangent of the curve KGS, by the action of B alone, having its north pole turned toward the south pole S of B. But, by the action of A alone, it would be a tangent to the curve NHM, having its north pole turned away from N. Therefore, by the combined action of both magnets, it will take neither of these positions, but an intermediate one, nearly bisecting the angle formed by the two curves, having its north pole turned toward B.

"But remove the needle to F. Then, by the action of the magnet A, it would be a tangent to the curve FM, having its north pole toward M. By the action of B, it would be a tangent to the curve KFG, having its north pole in the angle MFG, or turned toward A. By their joint action, it takes a position nearly bisecting the angle GFM, with its north pole toward A. Let the needle be placed in E. Then, by the action of the magnet A, it would be a tangent to the curve NEL, with its north pole pointing to F. But, by the action of B, it will be a tangent to SEI, with its north pole pointing to D. These actions being supposed equal and opposite, it will have no verticity, or will be neutral, and retain any position that is given to it.

"The curve SEI intersects the curve NHM in P and Q. The same reasoning shows, that when the needle is placed at P, it will arrange itself with its north pole in the angle SPH; but, when taken to Q, it will stand with its north pole in the angle EQM.

"From these facts and reasonings we must infer, that, for every distance of the magnets A and B, there will be a series of curves, to which the indefinitely short needle will always be a tangent.

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[1] *Library of Useful Knowledge*, art. *Magnetism*, p. 21.

"They will rise from the adjoining poles on both sides, crossing diagonally the lozenges formed by the primary or simple curves, as in fig. 37. These may be called compound or secondary magnetic curves. Moreover, these secondary curves will be of two kinds, according as they pass through the first or second intersections of the primary curves, and the needle will have opposite positions when placed on them. These two sets of curves will be separated by a curve GEH, in the circumference of which the needle will be neutral. This curve passes through the points where the primary curves touch each other. We may call this *the line of neutrality*, or inactivity.

"We now see distinctly the effect of bringing the magnets A and B nearer together, or separating them farther from each other. By bringing them nearer to each other, the point E, which is now a point of neutrality, may be found in the *second* intersection (such as F) of two magnetic curves, and the needle will take a sub-contrary position. By drawing them farther from each other, E may be in the *first* intersection of two magnetic curves, and the needle will take a position similar to that of C.

"If the magnets A and B are not placed so as to form a straight line with their four poles, but have their axes making an angle with each other, the contacts and intersections of their attending curves may be very different from those now represented; and the positions of the needle will differ accordingly. But it is plain from what has been said, that if we knew the law of action, and consequently the form of the primary curves, we should always be able to say what will be the position of the needle. Indeed, the consideration of the simple curves, although it was the means of suggesting to the writer of this article the explanation of those more complicated phenomena, is by no means necessary for this purpose. Having the law of magnetic action, we must know each of the eight forces by which the needle is affected, both in respect of direction and intensity; and are therefore able to ascertain the single force arising from their composition.

"When the similar poles of A and B are opposed to each other, it is easy to see that the position of the needle must be extremely different from what we have been describing. When placed anywhere in the line DF, between two magnets, whose north poles front each other in N and S, its north pole will always point away from the middle point D. There will be no neutral point E. If the needle be placed at P or Q, its north pole will be within the angle EPH, or FQI. This position of the magnets gives another set of secondary curves, which also cross the primary curves passing diagonally through the lozenges formed by their intersection. But it is the other diagonal of each lozenge which is a chord to those secondary curves. They will, therefore, have a form totally different from the former species."

CHAP. IX.—ON TERRESTRIAL MAGNETISM.

Terrestrial magnetism.

We have already seen, in preceding chapters, that a magnetic bar or needle, when either suspended by a thread, or at liberty to move freely upon a pivot, will, when all other magnetic bodies are entirely removed from it, settle in a fixed position, which, in this country, is about 25° to the west of north: this deviation of the needle from the north is called its *variation.* The very same thing will take place if a magnet or magnetised needle is placed on a piece of cork, and made to float on any fluid surface. The magnetic force by which the magnetic needle is thus made to take a fixed direction, and to return to it when it is pushed aside from that direction, has been naturally supposed to reside in the earth, and hence it has been called *terrestrial magnetism.*

But not only is a magnetised body *directed* in this manner by some unseen power; an unmagnetised body, such as a piece of iron, may be rendered permanently magnetic by the same power. This phenomenon is said to have been first observed in the vertical rod of the weather-cock of the church of the Augustines at Mantua, though others have ascribed the discovery of the fact to Gassendi. This rod had become magnetised by the continued action of the invisible power of which we speak. In later times it has been observed, that a bar of soft iron is, by the influence of the same power, converted into a temporary magnet, with a north and south pole, when it is placed in the direction which a magnetic needle assumes, and is inclined to the horizon.

If, in place of suspending the needle, or making it move horizontally on a pivot, we take an unmagnetised needle, and balance it upon a horizontal axis, then it will of course lie horizontally; but if we magnetise the needle, we shall find that it no longer remains horizontal, but takes an inclined position, or *dips*, as it is called; the *dip*, or the inclination downwards from a horizontal line, being about 70° in this country.

If we now take a magnetic needle, and suspend it by a silk fibre, we shall find, that when it is pushed out of its position of rest, it will perform a certain number of oscillations in a given time before it again takes a fixed position. When this observation is made in different latitudes, it is found that the needle is brought to rest sooner in some places than in others; which proves that the intensity or strength of the magnetic force which directs the needle to the north varies in different latitudes. Hence we have to consider three important classes of phenomena in reference to terrestrial magnetism.

1. The variation or declination of the needle, and its laws;
2. The dip or inclination of the needle;
3. The intensity of terrestrial magnetism;

of which we shall treat as perspicuously and fully as the nature of the subject and our confined limits will permit.

SECT. I.—*On the Variation of the Needle.*

Variation of the needle.

A general account of the phenomena of the variation of the needle has been given in the order of their discovery in the historical part of this article. We shall now proceed to give a more minute account of them.

Measures of the variation of the needle have been taken by navigators and travellers in every part of the globe. Setting aside the inaccuracies common to them all, arising from the imperfect instruments which were in many cases employed, the observations made on ship-board were particularly liable to error, owing to the action which the iron on board exercised upon the compass.

Halley.

The first person who attempted to collect and generalize the immense number of observations which had been made on the variation of the needle was Dr Halley, who published them in a sea-chart in 1700, in which he traced lines through all the parts of the globe where the variation was 0°, 5°, 10°, &c. These lines, which have since been called the *Halleyan lines* or *curves*, excited great interest, and had the advantage of giving, at one glance, an ocular picture of the phenomena in every part of the world. As this *Variation Chart*, however, soon became old, from the rapid changes in the variation, as well as from confused methods of observation, Messrs Mountain and Dodson collected, from the records of the admiralty, and from the papers of various naval officers, about 50,000, which they laid down in variation charts for 1745 and 1756.

The next step in the generalization of the phenomena

Churchman.

of variation was made by Mr Churchman, who published, in 1794, a programme of a *Magnetic Atlas.* He refers his variation lines to two poles, one of which he places, for the year 1800, in latitude 58° north, and longitude 134° west of Greenwich, very near Cape Fairweather; while the other pole is in latitude 58° south, and longitude 165° east of Greenwich. He supposes the northern pole to revolve in 1096 years, and the southern one in 2289 years.

Hansteen.

It is to Professor Hansteen, however, that we are indebted for the most satisfactory collection of observations on the variation of the needle, and for the most philosophical generalization of them. In the Magnetic Atlas which accompanies his work on the magnetism of the earth, he has published a variation chart for 1787, in which the irregularities and inflexions of the curves, and their total want of symmetry, prove how irregular are the causes on which terrestrial magnetism depends. In this chart, the *western line of no variation,* or that which passes through all the places on the globe where the needle points to the true north, begins in latitude 60°, to the west of Hudson's Bay, proceeds in a south-east direction through the North American lakes, passes the Antilles and Cape St Roque, till it reaches the South Atlantic Ocean, where it cuts the meridian of Greenwich in about 65° of south latitude. This line of no variation is extremely regular, being almost straight till it bends round the eastern part of South America a little south of the equator. The *eastern line of no variation* is exceedingly irregular, being full of loops and inflexions of the most extraordinary kind, indicating the action of local magnetic forces. It begins in latitude 60° south, below New Holland, crosses that island through its centre, extends through the Indian archipelago with a double sinuosity, so as to cross the equator three times, first passing north of it, to the east of Borneo, then returning to it and passing south between Sumatra and Borneo, and then crossing it again beneath Ceylon, from which it passes to the east through the Yellow Sea. It then stretches along the coast of China, making a semicircular sweep to the west till it reaches the latitude of 71°, where it descends again to the south, and returns northwards with a great semicircular bend, which terminates in the White Sea. These lines of no variation are accompanied through all their windings by other lines where the variation is 5°, 10°, 15°, &c. these last lines becoming more irregular as they recede from those of no variation. In the South Pacific Ocean, and the equatorial part of the North Pacific, they are so little dependent on the lines of no variation, that they form returning curves of an elongated oval form, the curves of 2°, 3°, 4°, 5°, 6°, and 7°, crossing the equator and the tropic of Capricorn twice, so that, in the centre or axis of the ovals which these lines form, there should be a fragment of a line of no variation.

Barlow.

The great changes which had taken place in the variation since 1787, and the number of new observations which had been made in every part of the world, induced Professor Barlow, in 1833, to construct a new variation chart, which forms a very interesting and valuable record of the present state of our knowledge on this subject.[1] With the kind permission of Professor Barlow, we have given a reduced copy of this chart in Plate CCCXXVII., and have included in it his separate polar projection of the variation lines within the arctic zone. When compared with the account given above of the two lines of no variation in Hansteen's chart, the motion of these lines, and of the whole system, will be distinctly seen.

In the charts both of Hansteen and Barlow the variation lines exhibit a convergency at their extremities;[2] and Hansteen considers it proved that there are *four points of convergency,* two in each hemisphere, a weaker and a stronger, on opposite sides of the poles of revolution. These four points he considers as the *four magnetic poles* of the globe; and, by comparing observations which have been made at different times, he concludes that they have a regular motion round the globe, the two northern ones from west to east, in an oblique direction, and the two southern ones from east to west, also obliquely. The following are the periods of their revolution, as calculated from the best observations previous to 1817, when his work was published:

The *strongest* NORTH pole in 1740 years.
The *strongest* SOUTH pole in 4609 years.
The *weakest* NORTH pole in 860 years.
The *weakest* SOUTH pole in 1304 years.

Upon these data he computed the following table, showing the position of these poles from 1800 to 1850:

Years.	Strongest *North* Pole.		Strongest *South* Pole.		Weakest *North* Pole.		Weakest *South* Pole.	
	West Longitude.	North Latitude.	East Longitude.	South Latitude.	East Longitude.	North Latitude.	West Longitude.	South Latitude.
1800	93° 33′	69° 53′	134° 8′	69° 7′	131° 43′	85° 25′	130° 28′	77° 50′
1810	91 28	69 45	133 21	68 59	135 54	85 18	133 14	78 3
1820	89 24	69 38	132 35	68 52	140 6	85 12	135 59	78 16
1830	87 19	69 30	131 47	68 44	144 17	85 6	137 45	78 29
1840	85 15	69 22	131 1	68 37	148 28	85 0	140 31	78 41
1850	83 10	69 14	130 14	68 29	152 40	85 0	143 16	78 54

Hansteen remarks, that the four periods above mentioned, viz. 860, 1304, 1740, and 4609, become, by a slight alteration, 864, 1246, 1728, and 4820; and he adds, rather fancifully for a matter of science, that these numbers are equal to 2 × 432, 3 × 432, 4 × 432, and 10 × 432, and that the number 432 is one of the most important among the sacred numbers of the Indians, Babylonians, Greeks, and Egyptians, which are said to depend on certain combinations of natural events. According to the mythology of the Brahmins, the duration of the world is divided into four periods; the first of which is 432,000 years; the second, 2 × 432,000; the third, and so in all $(1 + 2 + 3 + 4) = 10 \times 432{,}000$. Hansteen also considers it worthy of remark, that the sun's mean distance from the earth is 216 (the half of 432) radii of the sun, the moon's mean distance 216 radii of the moon, and, what he says is still more striking, $60 \times 432 = 25920$, the smallest number divisible at once by all the four periods; and hence, he adds, the shortest line in which all the four poles can accomplish a cycle, and return to the same state as at present, *coincides exactly with the period in which the precession of the equinoxes will amount to a complete circle*, reckoning the precession at a degree in seventy-two years.

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[1] See *Philosophical Transactions,* 1833, p. 667–675, and plates xvii. and xviii.

[2] Professor Barlow has inserted the magnetic observations of Commander Ross; and he remarks, that the very spot where this officer found the needle perpendicular, "that is, the pole itself, is precisely that point in my globe and chart in which, by supposing all the lines to meet, the several curves would best preserve their unity of character, both separately and conjointly, as a system." The exact place of the pole is laid down in the accompanying chart, Plate CCCXXVII.

Hansteen considers the four poles as originating in *two* magnetic axes, the two strongest being the termination of one axis, and the two weakest, of the other; and he conceives that they may have been produced either along with the earth itself, or at a later epoch. According to the first supposition, it is not easy to account for their change of position; but according to the last, they must have originated either from the earth alone, or from some external cause. If they originated in the earth, their change of position is still unsusceptible of explanation; and hence Hansteen conceives that they have their origin from the action of the sun heating and illuminating the earth, and producing a magnetic tension, as it produces electrical phenomena.

Since the publication of Professor Hansteen's work, the valuable observations made during the British voyages of discovery in the arctic regions have been given to the world; and, by availing himself of these, and obtaining access to others unpublished in the marine chart office at the Admiralty, the Norwegian philosopher has obtained more accurate determinations both of the positions and periods of revolution of the magnetic pole. The following is a brief abstract of his calculations.

1. *Strongest north pole.* In 1813 the observations made on board his majesty's ship Brazen, in Hudson's Bay, give 67° 10′ for the latitude of the strongest north magnetic pole, and 92° 24′ for its west longitude. Hence, by comparing this with previous determinations, we have

	Latitude of Pole.	West Longitude of Pole.
1730	70° 45′	108° 6′
1769	70 17	100 2
1813	67 10	92 24

From these data we obtain the motion of the pole to the east.

Epochs.	Years.	Change of Place in Longitude.	Annual Motion.
From 1730 to 1769	39	8° 4′	12′ 44″
1769 to 1813	44	7 38	10 41

From which we obtain

Mean annual motion of the pole .... 11′ 4″·25

Period of complete revolution .... 1890 years.

In August 1819, Captain Parry was to the north of this pole, and found the dip to be 88° 37′, and on the 11th September he was three degrees west of the pole. Hence, as his latitude was then 74° 27′, the latitude of the pole must have been about 71° 27′.

According to the more recent observations of Commander Ross, this pole, upon which he erected a flag, is situated in north latitude 70° 5′ 17″, and west longitude 96° 45′ 48″, which coincides strikingly with Hansteen's result.

2. *Strongest south pole.* By combining the observations of Cook in 1773 and 1777, with those of Furneaux in 1773, and comparing these with Tasman's observations in 1642, Hansteen has found the following position of it.

	Motion in 131 Years.
1642, north lat. 71° 5′; east long. 146° 57′	10° 14′
1773, north lat. 69° 26′ 5′; east long. 136° 15′ 4″	

Hence the real motion of this pole in 131 years is 10° 14′, or 4′·67 annually, and its period of complete revolution will be 4605 years.

3. *Weakest north pole.* By comparing observations made in 1770 and 1805, at Tobolsk, Tara, and Udinsk, in Siberia, Professor Hansteen found—

	North Latitude.	East Longitude.	Motion in 35 Years.	Annual Motion.
1770,	85° 46′	91° 29′ 30″	14° 35′	35′·128
1805,	85 21½	116 19		

Hence this pole completes its revolution from east to west in 860 years.

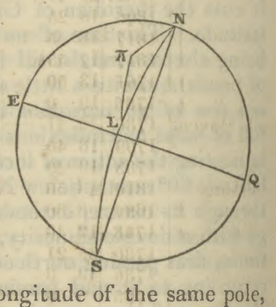
4. *Weakest south pole.* By comparing observations made by Cook and Furneaux in 1774, with those recorded by Halley as made in 1670, Hansteen obtained the following results:

	South Latitude.	West Longitude.	Motion in 104 Years.	Annual Motion.
1670,	64° 7′	94° 33½′	28° 43½′	16′·57
1774,	77 17	123 17		

Hence this pole completes its revolution from east to west in 1303 years.

Professor Barlow has endeavoured to deduce the position of the magnetic pole, upon the supposition that the magnetic phenomena of the earth are analogous to those exhibited by a simple iron ball. The tangent of the dip being equal to double the tangent of the magnetic latitude, Mr Barlow supposes π to be the magnetic pole, N, S the terrestrial poles, and L a known place where the dip and variation have been well ascertained. Then by the dip we obtain the magnetic latitude πL; NL being the terrestrial latitude, and NLπ the variation. Hence, in the spherical triangle NLπ, we have two sides and the contained angle to find the side Nπ the terrestrial latitude of the magnetic poles, and πNL the longitude of the same pole, in reference to the meridian NL.

Fig. 48.



In making this computation, Mr Barlow selected a certain number of the best observations on the dip and variation of the needle, made in different parts of the world, and he obtained the following results:

Place of Observation.	Date.	Dip.	Variation.	Computed Place of Magnetic Pole. North Lat.	Computed Place of Magnetic Pole. West Long.
Tristan d'Acunha	1821	37° 53′ S.	12° 0′ W.	70° 56′	49° 33′
Trinidad	1821	10 27 N.	5 0 W.	73 59	47 20
St Jago	1820	48 0 N.	15 55 W.	69 37	67 4
Teneriffe	1820	58 22 N.	20 47 W.	69 49	69 14
Madeira	1820	63 47 N.	23 7 W.	68 4	65 26
Madrid	1799	67 41 N.	19 59 W.	72 47	50 33
Paris	1814	68 36 N.	22 34 W.	75 31	67 4
London	1818	70 34 N.	24 30 W.	75 2	67 41
Berlin	1805	69 53 N.	18 2 W.	79 2	70 44
Copenhagen	1813	71 26 N.	18 22 W.	79 43	67 38
Davis' Straits	1820	83 43 N.	60 20 W.	67 37	94 26
Regent's Inlet	1820	88 26 N.	118 16 W.	71 10	98 16
Baffin's Bay	1820	84 30 N.	82 2 W.	71 13	97 3
Possession Bay	1820	86 4 N.	108 46 W.	69 40	99 10
Melville Island	1820	88 43 N.	127 46 E.	73 12	102 46

Among these results there is a discrepancy of no less than 55° in longitude, and 10° in latitude; and hence Mr Barlow concludes that every place has its particular polarising axis, which probably in all cases falls within the frigid zones, varying within these limits through all possible degrees of latitude and longitude.

These aberrations Mr Barlow ascribes to local inequalities in the distribution of the ferruginous parts of the terrestrial sphere.

The following tables contain the best measures of the variation of the needle. Table XI., containing the observations collected by Hansteen since the publication of his work, was communicated to the writer of this article by that eminent philosopher.

ABLE I.—*Containing the Variation of the Needle as observed in Denmark, Norway, and Sweden.*

mes of Places.	Year of Observation.	Magnetic Variation.	Names of Places.	Year of Observation.	Magnetic Variation.
Arendal,	1796	20° 21′ w.	Kongsör,	1746	9° 30′ w.
Aroga,	1799	17 25	Kusamo Church,	1776	5 30
Avestad,	1799	17 40	Lindesness,	1605	7 10 E.
Bergen,	1768	19 20	Lofoeden Isles,	1608	0 0
	1791	24 45		1609	0 0
	1792	25 30	Lund Pfarrhof,	1785	19 30 w.
Bömmel Island,	1792	24 52	Lyderhorn,	1768	19 20
Beested,	1780	34 30	Lindesberg,	1746	9 36
Christiansund,	1768	16 30	North Cape,	1769	6 0
Christiansand,	1794	22 0	Nora,	1799	18 35
Christiania,	1761	15 15	Norrberke,	1799	17 35
	1769	16 45	Orebroe,	1799	17 7
	1816	20 15	Patrixfiord,	1772	33 30
	1817	20 3	Rust Island,	1613	4 8 E.
Carlberg,	1799	17 5	Stavanger,	1794	22 26 w.
Carlscrona,	1716	11 15	Skudesness,	1613	8 0 E.
Copenhagen,	1649	1 30 E.	Stadthuk,	1768	19 10 w.
	1672	3 35 w.		1790	25 45
	1730	10 37	Stockholm,	1718	5 37
	1770	15 32		1771	13 4
	1782	17 41		1800	16 20
	1806	18 25		1817	15 34
	1817	18 5	Salberg,	1746	9 0
	1817	17 55½	Sala,	1799	16 0
Drontheim,	1761	13 50	Söderbärke,	1746	9 15
	1786	19 0	Sälö Bak,	1804	18 30
Drefiords Haven,	1786	42 41	Sädankyla,	1776	5 30
Fahlun,	1799	18 45	Skiervoens Church	1768	16 30
Flekeröe,	1783	19 29	Strömstad,	1804	18 0
Fredericksborg,	1810	18 50	Sulen Island,	1791	27 15
Gottenburg,	1694	8 30	Talvig,	1766	6 50
	1748	12 40	Torneo,	1695	7 0
Halnefiord,	1786	35 21		1736	5 5
Halnenshavn,	1786	43 9		1767	8 50
Hammerfest,	1765	6 50		1777	11 45
Heltappen Island,	1766	7 0	Utsjoki,	1748	3 30
Halöers Church,	1768	16 25	Upsal,	1718	5 37
Hveen Island,	1672	2 35		1746	8 45
Helsingöer,	1761	14 0	Uhma Capel,	1762	10 45
Hedemora,	1748	9 10	Uranienburg,	1672	2 35
Jukasjerwi,	1776	11 30	Wardhus,	1748	0 0
Kalvigs Church,	1766	5 30			0 30
Karasjok,	1768	6 50		1775	5 32
Kongswinger,	1779	17 30	Vadsöe,	1816	7 55
Kielens,	1803	21 0	Vangs Church,	1793	19 50
Köping,	1799	17 15	Vesteräs,	1799	17 50
Ny Kopparberget	1799	17 25	Vinga Bäk,	1804	19 0

ABLE II.—*Containing the Variation of the Needle in Russia.*

ames of Places.	Year of Observation.	Magnetic Variation.	Names of Places.	Year of Observation.	Magnetic Variation.
Awatscha Bay,	1805	5° 39′ E.	Irkutsk,	1735	1° 15′ w.
Barannoi Kamen,	1787	17 40		1805	0 32 E.
Barnaul,	1770	2 45	Jarowslawl,	1782	4 0 w.
Casan,	1761	2 25 w.	Jenicola,	1785	7 15
	1805	2 2 E.	Kola,	1769	1 45
Catharinenburg,	1761	0 50	Krementschuk,	1770	8 0
	1805	5 27	Krasnojarsk,	1735	2 0
Czechow,	1783	7 27 w.	Kiachta,	1735	3 0
	1811	5 17		1735	2 45
Cherson,	1782	10 10	Kiow,	1773	9 15
Cola,	1772	7 0	Kaluga,	1784	7 45
Dmitrewsk,	1771	5 49	Kursk,	1784	5 0
	1773	6 30	Kostroma,	1782	3 45
Dolia,	1773	10 40	Kesloff or Kozlov,	1785	11 38
St Elizabeth,	1770	9 45			
Gluchow,	1770	5 30	Lubny,	1782	9 5
Gurief,	1769	3 35	Moscow,	1732	5 26
Glubouca,	1615	18 0	Mosdok,	1785	6 40
Jakutskoi,	1768	5 15	Nezshni Kovima,	1787	14 40 E.
	1769	5 0	Nizni-Udinsk,	1735	3 15 w.
	1788	2 0		1805	2 40 E.

TABLE II.—*Continued.*

Names of Places.	Year of Observation.	Magnetic Variation.	Names of Places.	Year of Observation.	Magnetic Variation.
Nertchinsk,	1735	3° 0′ w.	Sietscha,	1770	9° 15′ w.
Neschin,	1779	10 0	Sisran,	1770	5 50
	1782	10 0	Selenginsk,	1735	0 30
Orenburg,	1769	3 30	Saratow,	1773	3 28
		3 20	Sewastropol,	1785	11 13
Orsk,	1769	0 15	Tscherkask,	1770	5 50
Orel,	1781	9 0	Tara,	1805	6 6 E.
Petersburg,	1726	3 15	Tomsk,	1805	5 37
	1782	7 30	Tobolsk,	1716	0 0
	1812	7 16		1761	3 46
Perm,	1805	1 10 E.		1805	7 9
Petropaulowska,	1779	6 19	Tanbow,	1784	5 45 w.
	1805	5 20	Umba,	1769	3 30
Petrosawodsk,	1785	5 9 w.	Ufa,	1769	1 30 E.
Ponoi,	1769	1 10 E.	Ustkamenogorskoi,	1770	2 0
Peczora,	1611	22 30 w.			
Pustozerskoi,	1614	20 0	Wologda,	1785	3 52 w.
Revel,	1751	7 30	Woronetz,	1783	8 0
Riga,	1750	8 0	Zarizin,	1770	4 50
Samara,	1770	8 10			

TABLE III.—*Containing the Variation of the Needle in Holland, Prussia, the Netherlands, and Switzerland.*

Names of Places.	Year of Observation.	Magnetic Variation.	Names of Places.	Year of Observation.	Magnetic Variation.
Antwerp,	1600	9° 0′ E.	Konigsberg,	1628	1° 0′ w.
Amsterdam,	1767	17 30 w.		1642	1 5
Augsburg,	1772	16 40		1774	13 30
	1798	18 26	Leipsic,	1749	13 0
Berlin,	1717	10 42	Manheim,	1776	19 48
	1780	16 48		1785	19 44
	1805	18 2		1786	19 53
Bonne,	1782	17 20		1787	20 2
	1788	18 55		1788	20 5
Dantzig,	1628	1 0	Mittau,	1783	10 52
	1760	11 0	Middleburg,	1786	21 14
	1811	13 48		1788	21 56
Dusseldorf,	1783	20 0	Nuremberg,	1685	5 5
Dresden,	1797	18 30	Prague,	1774	15 45
Freyberg,	1769	15 40		1787	17 20
Frankfort-on-Maine,	1774	16 32	Rotterdam,	1767	19 0
Franeker,	1771	19 30	Regensburg,	1784	17 49
	1773	18 30		1786	19 11
Geneva,	1797	19 40	Tübingen,	1747	13 34
	1804	21 13		1752	14 37
Grätz,	1770	15 50	Tankermund,	1814	19 0
Göttingen,	1777	16 48	Vienna,	1638	0 0
Hague,	1782	20 16		1760	13 0
Inspruck,	1787	22 40 ?	Wurtzburg,	1781	18 40
Konigsberg,	1600	0 0		1787	18 35
			Zurich	1762	15 15

TABLE IV.—*Containing the Variation of the Needle as observed in France.*

Names of Places.	Year of Observation.	Magnetic Variation.	Names of Places.	Year of Observation.	Magnetic Variation.
Antibes,	1682	3° 40′ w.	Montpellier,	1644	1° 10′ w.
Bayonne,	1680	1 20	Ushant Island,	1776	23 1
Boulogne,	1767	17 26	Paris,	1541	7 0 E.
Brest,	1679	1 45		1580	11 30
	1771	20 10		1660	1 0
	1798	25 30		1667	0 15 w.
Calais,	1681	4 30		1700	7 40
	1767	19 30		1750	17 15
Dieppe,	1619	6 30 E.		1780	20 35
Dunkirk,	1767	18 33 w.		1800	22 12
Havre de Grace,	1767	19 15		1819	22 29
	1782	22 15	Royan,	1680	1 20
Marseilles,	1761	18 0	Toulon,	1682	2 45
	1798	20 55	Toulouse,	1747	15 10
St Maloes,	1681	2 0		1756	15 45

TABLE V.—*Containing the Variation of the Needle, as observed in Great Britain and Ireland.*

Names of Places.	Year of Observation.	Magnetic Variation.
Bristol,	1666	1° 27′ w.
	1667	1 33
Bushy Heath,	1813	24 22 17
	1822	24 35 26
Dublin,	1745	18 0 w.
	1791	27 23
London,	1580	11 15 E.
	1657	0 0 w.
London,	1790	23° 39′ w.
	1800	24 3·6
	1823	24 9 40
Plymouth,	Unknown.	13 24 E.
	1733	13 27 w.
Stromness Harbour,	1774	24 0

TABLE VI.—*Containing the Variation of the Needle, as observed in Portugal, Spain, and Italy.*

Names of Places.	Year of Observation.	Magnetic Variation.
Aranjuez,	1798	19° 25′ w.
Alborne Island,	1733	14 12
Braga,	1761	16 15
Brescia,	1676	4 0 E.
Cadiz,	1724	5 25 w.
	1769	17 15
	1791	21 56
Cape St Vincent	1733	13 49
Cape St Gatt, Sp.	1733	13 56
Cape St Mary's, P.	1734	14 20
Cape Finisterre	1589	7 40 E.
	1768	21 4 w.
C. St Antonio, S.	1792	19 23
Ferrara,	1677	2 0
Gibraltar Bay,	1733	13 38
	1761	17 11
	1792	22 6
Lisbon,	1638	7° 39′ E.
	1668	0 50 w.
	1697	4 18
	1782	19 51
Loretto,	1756	15 35
Madrid,	1799	19 59
Malta,	1694	9 15 9 45
	1708	10 25
Minorca, C. Mola,	1733	14 34
Padua,	1725 1730	13 0
	1770	16 20
Rome,	1670	2 15
	1730	11 0
	1788	17 12

TABLE VII.—*Containing the Variation of the Needle, as observed in Turkey in Europe.*

Names of Places.	Year of Observation.	Magnetic Variation.
Akiermann,	1771	9° 25′ w.
Bender,	1772	9 45
Bucharest,	1772	11 36
Constantinople,	1600	0 0
	1625	2 0
Constantinople,	1694	9° 0′ w. 12 0
Ofen,	1781	16 45
	1788	16 36

TABLE VIII.—*Containing the Variation of the Needle, as observed in Asia and the adjacent Islands.*

Names of Places.	Year of Observation.	Magnetic Variation.
Alexandretta, Syria,	1694	14° 22′ w.
Aden, Arabia,	1612	13 40
	1612	12 40
	1674	15 0
	1723	13 50
	1723	13 42
Ava, India,	1689	5 0
Aleppo, Syria,	1781	12 30
Alguarda, near Goa	1722	5 49
Anjanga, India,	1724	4 17
Bab-el-Mandeb,	1723	14 20
	1723	14 8
Baixos de Chagos Island,	1610	19 50
Beit-el-Fakih,	1762	11 50
Bachian Island, Amasane Bay,	1612	4 48 E.
Bombay, India,	1676	12° 0′ w.
	1751	5 12
	1721	5 16
	1722	5 7
	1723	5 10
Banca Island,	1791	0 0
Balasore, India,	1680	8 20
Do. Cape Palmiras,	1722	3 33
Calicut,	1722	4 5
	1772	4 9
Canton,	1690	2 25
	1722	1 30
Carwar Bay, India,	1722	5 40
	1722	5 4
	1723	5 8
	1724	5 32
Celebes, Bonthain,	1767	1 16

TABLE VIII.—*Continued.*

Names of Places.	Year of Observation.	Magnetic Variation.
Chaul, India,	1721	5° 27′ w.
Cape Comorin, India,	1601	16 0
	1620	14 20
	1680	8 45
	1688	7 30
	1723	2 51
Ceylon,		
Friar's Hood,	1722	2 12
	1722	2 21
Point de Galle,	1613	13 24
	1723	2 46
	1723	2 45
Chandernagore, India,	1731	3 0
	1750	0 0
Cochin, India,	1614	15 0
	1724	4 16
Daman, India,	1612	16 30
Dabul, India,	1610	15 34
	1611	16 30
Derbent, Persia,	1712	12 0
Darsina, Arabia,	1612	15 2
Doy or Doa, Molucca Isl.	1613	5 20 E.
Firando, an island near Japan,	1613	2 50
Goa, India,	1609	16 0 w.
	1724	5 41
Guadal Cape, Persia,	1613	17 15
	1616	18 0
Hainan Isl. China,	1613	0 50
Hyderabad, 27th June,	1804	1 16·39 E.
Java Bantam,	1609	3 0 w.
Batavia,	1767	1 25
	1768	0 25
Palimbang,	1605	3 20
Ispahan, Persia,	1787	7 30
Iriseh,	1797	8 14
Ingana Island,	1607	4 13
Jask Cape, Persia,	1616	19 20
Judda, Arabia,	1769	11 52
	1776	12 55
Kasbin, Persia,	1787	7 33
Kerguelen's Land,	1776	27 44
Louveau, Siam,	1685	4 45
	1685	0 30 ?
	1686	4 45
	1688	4 30
Lucepara Island,	1767	0 0
Macao,	1616	1 30
	1779	0 32
Madras, India,	1722	2 52
	1723	3 16
Madura Island, near Java,	1768	0 30
Mangalore, India,	1722	5° 24′ w.
	1722	5 25
	1723	5 5
Masulipatam, India,	1610	12 22
Machian Island, near Gilolo,	1612	4 12 E.
	1613	3 38
Maldevische Canal,	1605	17 0 w.
	1722	4 16
Mazeira Island, Arabia,	1613	20 10
Mocha, Arabia,	1723	13 24
	1769	12 33
	1776	11 20
Mindanao, Cape St Augustin,	1767	1 45 E.
Nankin, China,	1685	0 0 w.
Nicobar, India,	1605	7 5
Paliacate, India,	1611	13 15
	1613	13 10
Patapilli, India,	1611	12 47
	1611	12 22
	1613	13 50
Pondicherry,	1689	7 0
Prince's Island, near Java,	1767	1 0
	1780	0 54
Pulo Condore Island,	1620	1 0
	1780	0 14
Pekin,	1755	2 0
St Paul's Island,	1677	23 30
Roquepiz Island,	1610	23 30
Rogipore (Rajapur),	1722	4 58
Rasalgat Cape, Arabia,	1613	19 20
Sually,	1610	16 40
	1611	16 30
	1612	17 0
Sunda Strait,	1615	3 30
Sinde,	1613	16 45
Sinope,	1797	10 18
Surat,	1611	16 23
	1723	5 22
Singanfu, China,	1689	3 17
Sumatra,		
Achen,	1610	6 15
Marlborough Ft.	1794	1 10 E.
Priaman,	1795	1 8
	1612	4 10 w.
	1613	4 50
Tellichery, India,	1722	4 21
	1722	4 4
Tiiz,	1613	18 30
Tecu Island,	1612	4 40 E.
Xin-Yam, China,	1682	0 0 w.
Ula, China,	1682	1 40 E.

TABLE IX.—*Containing the Variation of the Needle, as observed in Africa and the adjacent Islands.*

Names of Places.	Year of Observation.	Magnetic Variation.
Alexandria, Egypt,	1638	5° 45 w.
	1798	13 6
Ascension Isl.	1678	1 0 E.
	1754	8 6 w.
	1775	10 52
	1806	15 40
Accara Fort, Guinea,	1726	11° 25′ w.
	1726	11 53
Angoxa,	1611	12 1
Ab-dal-Curia Island, west of Sowtora,	1612	17 23
	1723	12 43

TABLE IX.—*Continued.*

Names of Places.	Year of Observation.	Magnetic Variation.
Algiers, Barbary,	1731	14° 0′ w.
Azores Islands,		
Fayal Bay,	1589	3 5 E.
	1775	22 7 w.
Flores,	1600	0 0
Marie,	1610	1 40 E.
Babel-Mandeb,	1723	14 20 w.
	1723	14 8
Baxos de Chagos,	1610	19 50
Bourbon, Isle of, Mascarenhas,	1614	22 48
St Paul's Bay,	1722	19 49
	1722	19 44
Booam,	1616	13 12
Cape Coast,	1726	11 55
	1726	12 10
	1726	11 46
Canary Islands,		
Ferro,	1724	5 0
	1769	17 30
	1802	19 55
Lanzarote,	1610	6 6 E.
Madeira, Funchal,	1727	6 58 w.
	1766	14 10
	1766	16 0
	1771	18 0
	1783	18 22
	1802	20 21
Grand Canary,	1610	6 6 E.
Teneriffe, Santa Cruz,	1769	15 43 w.
	1770	15 30
	1776	14 41
	1776	15 55
	1785	15 52
	1788	20 1
	1792	16 32
	1803	16 1
Comora Islands,		
Angoxa, on coast of Africa,	1611	13 0
	1721	19 12
	1721	19 44
	1721	20 33
Anjouan,	1722	20 39
	1722	20 33
Mayotta,	1722	21 12
	1722	20 24
Mohalio,	1611	15 20
Cape Verd Islands,		
Porto Praya, St Jago,	1725	4 5
	1766	8 20
	1766	8 20
	1772	10 45
	1791	14 12
Mayo,	1725	3 32
	1776	9 32½
Sal,	1610	3 30 E.
Cairo,	1694	12 15 w.
	1761	12 25
	1762	11 40
	1798	12 0
Damietta, Egypt,	1694	12 30
Doara, Ajan,	1611	17 36
	1611	17 20
Prince Edward's Island,	1776	26 15
France, Isle of (Mauritius),	1609	21° 0′ w.
	1722	18 46
	...	18 39
	...	19 7
	...	19 45
Cape of Good Hope,		
Cape l'Aguillas,	1609	0 12
Saldanha Bay,	1605	0 30 E.
	1614	1 30 w.
Simon's Bay,	1780	22 16
	1791	23 40
Table Bay,	1614	1 45
	1667	7 15
	1675	8 28
	1687	8 30
	1699	11 0
	1702	12 50
	1706	13 40
	1708	14 0
	1721	16 25
	1724	16 27
	1724	16 18
Gorée,	1682	0 0
	1769	12 15
	1772	10 30
Guardafui, Cape,	1610	17 35
	1723	12 34
Hermanas Isl. near Cape Guardafui,	1612	17 23
St Helena, Island of,	1600	8 0 E.
	1691	1 0 w.
	1806	17 18
Madagascar,		
Augustin's Bay,	1607	15 30
	1721	23 48
Antongill Bay,	1661	22 30
	1761	18 0
Fort Dauphin,	1661	19 0
	1761	22 7½
Foul Point,	1762	16 45
St Sebastian, Cape,	1600	16 0
	1722	18 36
St Mary's Isl. near Madagascar,	1610	19 50
	1722	19 53
Nosf-Gombi, an island near Madagascar,	1722	20 0
Salée Roads,	1735	12 19
Sierra Leone,	1608	1 50 E.
	1725	5 12 w.
Sunken Rocks, S. lat. 31° 48′,	1606	21 0
Socotra, Island of,	1611	16 0
	1776	8 6
St Thomas, Isle of,	1726	14 48
	1726	14 32
Tripoli,	1733	13 22
Trinidad Island, S. lat. 20° 45′ N. long. 29° 30′.	1615	12 0 E.

TABLE X.—*Containing the Variation of the Needle, as observed in America and the adjacent Islands.*

Names of Places.	Year of Observation.	Magnetic Variation.
Acapulco,	1744	3° 0′ E.
Albany Fort,	1730	23 0 w.
Antigua Island,	1774	17 0 w.
	1727	4 28 E.
	1761	4 31 w.
Augustin, Cape,	1670	5 30 E.
Bear Island,	1596	13 0
	1610	13 30
Beverley,	1781	7 4 w.
Barbadoes, Carlisle Bay,	1726	4 24 E.
	1761	3 47
Bastimento's Isle,	1726	7 48
Boston,	1708	9 0 w.
	1741	7 30
Button Isle,	1615	24 0
	1730	39 0
Buenos Ayres,	1708	15 32 E.
Bahia, Brazil,	1708	4 30
Cambridge,	1708	9 0 w.
	1783	6 52
Cape Cathivas,	1726	7 24 E.
Carthagena,	1705	7 12
	1726	6 50
St Croix Island,	1783	3 20
StChristopher's, Basseterre,	1726	4 10
Cuba,		
Pau de Matanzas,	1726	4 24
Havannah,	1732	4 30
Cayenne Island,	1672	11 0
	1682	5 30
Conception,	1709	10 20
Coquimbo,	1700	8 32
Curaçoa,	1704	6 40
Cumana,	1799	4 14
Chesapeake Bay,	1732	4 58 w.
Cod Bay,	1789	6 45
Cape Christian, Greenland,	1605	12 15
St Catherine's Island,	1712	12 0 E.
	1785	12 0
	1804	7 51
Cape Corientes,	1684	4 28
Discovery Harbour,	1792	21 30
Desolation Sound,	1792	19 16
St Diego, California,	1792	11 0
Deseado Island,	1726	3 27
Domingo,		
Cape François,	1772	5 20
	1776	5 30
	1783	5 32
Alta Vela Island,	1728	6 2
Frio, Cape,	1670	12 10
Fernando Naronha,	1610	8 10
Florida, Cape,	1726	3 26
Fuego, Terra del,		
Christmas Sound,	1774	24 43
Good Success Bay,	1769	24 9
Godthaab, Greenland,	1784	50 30 w.
	1787	51 21
Guadaloupe,	1726	3 22 E.
Hermit Island,	1707	20 0
Juan Fernandez,	1767	11° 0′ E.
Jamaica,		
Portland Point,	1726	6 2
Port Royal,	1726	4 31
Black River,	1732	6 2
Jamba Point,	1726	6 20
Lima,	1709	6 15
Mexico,	1769	5 30
Martinique,	1682	4 10
	1704	6 10
	1760	5 41
Marie Galante Island,	1726	3 40
St Martha, Cape,	1704	7 6
Massafuera Island,	1765	9 36
	1767	10 24
	1795	9 15
Mendocino, Cape,	1693	2 0
	1786	14 24
Moose Fort, Hudson's Bay,	1774	17 0 w.
Musquito Cove, Greenland,	1776	50 36
Monterrey,	1795	12 22 E.
Montserrat,	1765	5 32
Newfoundland,		
Fort St Pierre,	1772	19 15 w.
Nutka,	1778	19 45
	1792	18 22 E.
Norton Sound,	1778	25 45
Norriton,	1770	3 8 w.
Porto Bello,	1704	7 25 E.
Pisco,	1707	7 0
Paraibo,	1698	5 35
Quito,	1742	8 30
Quebec,	1649	16 0 w.
	1686	15 30
Rio Janeiro,	1768	7 34 E.
	1787	6 12
Resolution Island,	1615	24 6 w.
Savage Island,	1615	27 30
Smith's Sound,	1616	57 0
Santiago, Chili,	1794	14 28 E.
Sebalt Island,	1683	23 10
	1707	23 0
Spitzbergen,		
Bell Sound,	1613	13 11 w.
Cross Rheid,	1596	16 0
Horn Sound,	1610	16 0
	1613	12 37
Magdalen Sound,	1614	25 0
Poopy Bay,	1613	15 21
Read, Beach,	1596	16 0
Vogelsang,	1773	20 38
Unalashka Samganoodha Harbour,	1778	19 59 E.
Vera Cruz,	1769	6 40
	1776	7 30
Valparaiso,	1709	9 30
	1795	14 49
Valdivia,	1670	8 60
Prince of Wales' Fort,	1725	21 0 w.
	1742	17 0
	1769	9 41
Ylo, Peru,	1710	6 38 E.
York, New,	1686	8 45
	1723	7 20
	1789	4 20

TABLE XI.—*Containing the Variations of the Needle according to the latest observations.*

Names of Places.	Year of Observation.	Magnetic Variation.
I.—*Denmark, Norway, Sweden, and Finland.*		
Anholt Island,	1788	19° 8′ w.
Abbo, Finland,	Sept. 27, 1825	11 20
Brahestad, Finland,	Sept. 1825	10 38
Christiansand,	Mar. 18, 1782	20 0
Christiania,	May 17, 1780	18 42
	Mar. 10, 1817	20 3
	May 24, 1822	19 47
Dagerort Island,	1800	12 0
Fredriksteen, Norway,	Mar. 24, 1799	18 0
Jinnska Utön,	1800	13 0
Gran, Norway,	1821	18 50
Hammerfest,	1823	11 26
Gottska Sandoe,	1800	14 40
Landsort, Sweden,	1800	15 20 w.
Nörtstaböe, Norway,	1821	22 12
Pitea, Sweden,	1825	10 6
Svarfvarort, Sweden,	1800	13 40
Throndhjem, Norway,	July 28, 1825	19 36
Torneo, Finland,	Aug. 1825	12 7
Ullensvang, Norway,	1821	22 51
Uleaborg, Finland,	1791	10 0
	1825	9 32
Uloma, Cassel N.	Sept. 1761	10 45
Wardoe, Norway,	July 7, 1816	5 57
Wasa, Finland,	Oct. 4, 1811	11 45
	April 25, 1825	12 38
II.—*Russia.*		
Astracan,	April 17, 1580	13 40 w.
Archangelsk,	1800	0 30 w.
	1824	2 7 E.
Colmogro,	May 23, 1557	5 10 E.
Dog's-nose,	June 2, 1557	4 0 E.
Jokanskish Island,	1800	1 30 N.
	1824	1 7 E.
Kildin Island,	1824	1 2 w.
Krakau,	1821	14 30 w.
Matotschki, Nova Zemble,	1769	3 30 E.
	1824	10 34 E.
Olenish Island,	1824	1 23 w.
Mescwa,	Aug. 1732	5 26 w.
	1790	3 47 w.
	1805	5 24 w.
Petersburg,	June 1817	7 15 w.
	Sept. 1818	7 27 5
Peczora,	July 17, 1556	3 30 w.
Seven Islands,	1824	0 30 w.
Tri Ostrowe Island,	June 16, 1557	3 30 E.
Udinsk,	1805	2 40 E.
Waigats Island,	1556	8 0 w.
III.—*Germany, Netherlands, and Switzerland.*		
Aurich, Netherlands	March 1819	20 43 w.
	June 1821	20 46½
	Sept. 1821	20 35
Berlin,	Oct. 14, 1825	17 40
Bentheim,	Nov. 11, 1817	19 41
Bochholt,	1822	20 58
Emden,	1816	20 42
Kirchesepe,	Sept. 30, 1817	20 18½
Kremsmunster,	1815	17 20
	1820	16 20
	1824	16 25
Leipzig,	July 12, 1825	17 45
Meppen,	Sept. 11, 1817	20 37
Nordhorn,	Nov. 12, 1817	19 53
Wisens,	April 1821	20 32
Wittmund,	July 1821	20 36
IV.—*France.*		
Brest,	1818	25° 7′ w.
Cherbourg,	1813	26 47
Havre de Grace,	Sept. 26, 1768	19 42
Lyons,	Nov. 1751	15 45
	Dec. 1755	16 30
	1761	18 45
Ouessant Island,	Dec. 1806	26 45
Paris,	Oct. 12, 1816	22 25 w.
	1819	22 29
	Oct. 3, 1829	22 12
Toulon, Cape Side,	April 25, 1811	19 10
V.—*England.*		
Edinburgh,	Oct. 29, 1808	27 31·8
	Nov. 3, 1809	27 35·2
	Sept. 29, 1812	28 8·0
	July 9, 1823	27 48·0
Gravesend,	June 12, 1576	11 30 E.
Hermitage Hill, Leith,	1823	27 0 w.
London,	June 1806	24 8·6
	October 1812	16·5
	June 1816	17·9
	1820	11·7
	1823	9·8
Stromness, Orkney,	June 3. 1819	27 50
VI.—*Portugal, Spain, and Italy.*		
Alicante,	Sept. 4, 1800	19 25
Aulona,	1818	14 0
Barcelona,	1785	18 0
Budua,	1818	14 56
Cadiz,	Oct. 29, 1768	19 12
Carthagena,	March 1789	18 45
	June 2, 1798	19 3
Cabrera Island,	Sept. 29, 1789	19 0
Corunna,	1806	20 47
Durazzo,	1818	15 58
Eba,	June 15, ——	18 19
Portoferraio, Piombino	—— 16, ——	16 29
Fiumicino,	—— 19, ——	17 45
Gorgonna,	—— 2, ——	19 0
Girgenti,	July 18, ——	17 30
Ischia,	June 16, 1798	18 22
Lagos Bay,	Oct. 25, 1788	18 0
Leghorn,	—— 20, 1731	9 42
	1785	18 0
	1795	19 20
	July 8-11, 1818	19 20
Lissabon,	1811	22 45
Maritimo,	Aug. 6, 1807	19 40
Maritimo Island,	May 28, 1818	17 0
	July 16, 1818	18 0
Malaga Bay,	Dec. 1, 1788	19 50
Malta,	1612	11 0
Minorca, C. Mola,	April 15, 1811	19 30
Palermo, C. Guals,	1790	17 0
	1814	18 30
Ustica,	July 15, 1818	17 30
Vido Fort, Alessandro,	——	14 34
VII.—*Hungary and Turkey.*		
Constantinople,	1797	12 33
Corfu,	1818	14 34
Maudry Bay,	1793	13 20
Imbro Island, Dard.	Aug. 27, 1807	12 32
Trebizonde,	1797	8 14
VIII.—*Asia and neighbouring Islands.*		
Alceste Island,	July 21, 1816	2° 3′ w.
Basil's Bay,	Sept. 4, 1816	2 0 w.
Bata Harbour,	April 15, 1803	1 23 w.
Bildih,	June 11, 1580	10 40 w.
Cheaton Bay,	Aug. 22, 1816	2 10 w.
Cape Comorin,	Mar. 30, 1815	2 9 E.
Congo River,	July 1816	25 58 w.
Pointe de Galle, Ceylon,	April 2, 1814	2 15 E.
Trincomalee,	Sept. 27, 1812	1 9 E.
Derbent,	October 1580	11 0 w.
Hyderabad,	June 27, 1804	1 16 E.
Batavia, Java,	July 29, 1814	0 17 E.
Sourabaya,	October 1793	2 31 w.
	Sept. 1824	0 10·4 w.
Lam-Get Island,	June 16, 1816	0 9 w.
Macao,	April 21, 1792	1 12 E.
Madras,	1809	3 0 E.
Morebat Bay,	1781	6 40
Muscat-Cove,	1785	6 0
Mocha,	1795	11 0
Murray's Sound,	Sept. 8, 1816	2 0 w.
Napikiang Roads, Port Melville,	Oct. 8, 1816	0 52 w.
Pecho Mouth,	July 27, 1816	2 14 w.
Princes Island,	May 16, ——	20 7 w.
Sandy Island,	July 27, ——	2 14 w.
Achen, Sumatra,	May 1, 1814	2 25 E.
IX.—*Africa and neighbouring Islands.*		
Alexandria,	May 11, 1694	12 48 w.
	April 8, 1822	10 58
Alboran Island,	Jan. 8, 1818	21 28½
Africa Islands,	1802	7 44
Ascension,	1816	15 30
	Jan. 1825	16 52
Akromar,	March 1823	11 16
Ambucol,	April ——	10 46
Fagel, Azores,	1814	23 30
Bareedy Harbour,	1776	13 53
Bomba,	1821	14 55
Bourbon, St Denys,	Aug. 10, 1813	17 20
Canaries,		
Funchal,	1802	19 10
	1811	21 0
	1813	22 0
	1816	21 10
	Feb. 1829	21 32
	Mar. 24, 1819	19 10
	July 5, 1821	25 58
S. Cruz Bay, Teneriffe,	1816	21 20
Orotava,	——	20 33
Santa Cruz,	Feb. 16, 1819	18 53
	Aug. 29, 1822	21 0
Chagos (Diego Garcia)	1786	1 59
Eleven Islands,	——	2 10
Commorish Islands, Mayotta,	1750	20 0
Cape Verd Islands,		
Porto Praya,	1812	10 15
	Mar. 18, 1819	13 30
Bonavista,	Apr. 8, 9, ——	14 2
Mayo,	April 1819	13 9
Sal,	Feb. 26, 1819	14 5
Mauritius, (Gard. Pr.)	Aug. 1805	11 42½
	Mar. 15, 1813	16 40
	Oct. 1824	13 46

Names of Places.	Year of Observation.	Magnetic Variation.
Cape of Good Hope,	1792	24° 30′
able Bay,	1813	28 0
ape Town,	——	27 30
Goree,	1801	16 0
	1815	19 35
	Mar. 21, 1819	15 50
Gough's Island,	—— 4, 1732	0 0
	Dec. 1813	11 51
Kissics Bay,	1799	11 15
St Helena,	Apr. 1793	15 28
Jamestown,	1815	17 30
	1816	17 30
Jamestown,	Dec. 1824	19 34·5
Mozambique Harb.	1802	18 40
Madagascar,		
Majambo Bay,	Feb. 1803	16 25
Morvundava,	Aug. 1714	22 30
ugustin's Bay,	1798	23 30
	1804	24 0
Bembatooka Bay,	1802	17 30
Nareenda Bay,	——	15 50
Pta,	1751	16 17
Prince Wales Island,	1819	22 30
Recief Cape,	Aug. 1797	26 40
	1814	29 20
Rasalgate,	1810	5 20
Suez Harbour,	1777	12 6
Tristan d'Acunha,	Mar. 6, 1813	9 51 N.
Tripoli,	1816	16 60
	June 1822	16 35
St Thomas' Island,	May 20, 1816	22 48
Quiloa Island,		17 22

X.—*America and neighbouring Islands.*

Names of Places.	Year of Observation.	Magnetic Variation.
Acapulco,	Apr. 29, 1791	7 44 E.
	1821	8 46 E.
Arica,	1713	8 0 E.
	1821	10 25 E.
Arauco,	——	18 22 E.
Ancon,	——	10 25 E.
Baffin's Three Isles,	July 12, 1818	80 44 W.
S. Blas California,	Apr. 12, 1791	7 28 E.
	1821	8 40 E.
Brandon House,	1808	12 12 E.
Bear Lake,	1807	8 0
Carlisle B. Barbadoes,		4 30 E.
Curaçoa,	July 18, 1704	6 40 E.
	May 24, 1814	4 0 E.
	Mar. 10, 1818	2 1 E.
	1787	7 0 E.
Cayman,	1815	6 45 E.
Callao Castle,	1821	10 3 E.
Carthagena,	Nov. 1735	8 0 E.
	Jan. 1787	11 0
	May 1813	6 32
Point Coles,	1821	10 18 E.
Carlton House,	1807	15 16 E.
Chipewyan Fort,		16 0 E.
Havanna, Cuba,	1815	7 0 E.
	Aug. 1816	5 30
Cape,	Sept. 20, 1799	3 15
S. Carlos de Chiloe,	Feb. 8, 1790	17° 36′ E.
Conception,	Nov. 21, 1791	14 52 E.
Coquimbo,	1712	10 0 E.
	Apr. 28, 1791	11 46
	1821	14 0
Callao de Lima,	1713	10 0 E.
	June 7, 1791	9 37½
	Mar. 3, 1823	9 30
S. Catharina,	Oct. 1822	6 25 E.
Churchill Fort,	1807	5 39 E.
S. Croix Island,	July 14, 1826	1 15 E.
Dominica,	June 22, 1760	3 20 E.
Pr. Rupert Bay,	Apr. 8, 1819	2 40 E.
Puerto Deseado,	Dec. 7, 1789	19 50 E.
Domingo,		
C. Francais,	1745	5 15 E.
Alta Vela,	Feb. 1818	5 21 E.
Port Egmont,	Dec. 19, 1790	22 34 E.
Erie Fort,	1817	1 42 E.
Sta. Fé de Bogota,		7 35 E.
Fernando Noronha,	May 1745	2 10 E.
Guayra,	Jan. 24, 1800	4 20 E.
	June 3, 1814	4 53
Guayaquil,	Oct. 11, 1791	9 11 E.
	1821	9 5
Guadaloupe,	1809	4 55 E.
Guasco,	1821	13 30 E.
Hare Island,	June 1818	71 58 W.
Juan Fernandez,	1744	8 30 E.
	1802	14 0
Jamaica, P. Royal,	Nov. 1789	6 30 E.
	1817	4 40
Lima,	Dec. 1740	9 2 E.
	1802	9 50
Mexico,	Dec. 1803	8 8 E.
Mobile Bay,	—— 1814	6 30 E.
Martinique,	1735	6 0 E.
F. Royal,	1816	6 45
S. Martha,	1743	6 35 E.
Mas-a-Fuera.	1802	13 0 E.
Mohawk Bay,	1815	0 4 E.
Port Mulgrave,	July 1, 1791	26 40 E.
Le Maire Str.	1712	24 0 E.
Mollendo,	1821	11 5 E.
Mocha Island,	1821	19 34 E.
Monte Video,	Sep. 23, 1789	13 40 E.
	Aug. 1807	13 20
Monterras,	Sep. 23, 1791	10 56 E.
Niagara Fort,	1817	1 27 E.
Nuacho,	1821	9 36 E.
Nootka,	Aug. 17, 1791	22 30 E.
Panama,	Nov. 1775	7 49 E.
	Dec. 3, 1791	7 49
	1802	8 0
Payta,	1821	7 0
	1821	9 0 E.
	Mar. 8, 1823	8 56 E.
S. Pescadores,	1821	11 20 E.
Porto-Bello,	Nov. 1735	8 40 E.
	1814	8 30
	1815	6 0
P. of Wales' Fort,	1798	1° 0′ E.
	1807	5 39
	Sep. 3, 1813	6 0
Pernambuco,	1815	3 0 W.
Penedo S. Pietro,	1813	6 0 W.
La Plata,	1743	8 30 E.
Cuito,	Feb. 1802	9 24 E.
Realeyo,	Jan. 23, 1791	9 20 E.
Rio Janeiro,	1821	3 21 E.
Talcahuana,	Nov. 21, 1793	14 52 E.
	1821	15 30
Fort Galvez,	Feb. 1823	16 16·4
St Thomas Island,	1816	2 24 E.
Vera Cruz,	Mar. 15, 1769	6 28 E.
	1815	10 37
	Apr. 27, 1819	9 16
Valparaiso,	Mar. 11, 1709	9 30 E.
	1744	12 30
	Mar. 20, 1709	13 39
	1795	14 49
	1802	14 55
	1821	14 43
Valdivia,	1788	17 30 E.
S. Vincent's Island,	Mar. 31, 1814	7 30 E.
William's Fort,	Dec. 8, 1816	5 30 E.
Wollaston's Lake,	1807	18 2 E.
Ylo,	1802	10 30 E.
York Fort,	1807	4 55 E.
	Sep. 1819	6 0·3 E.

XI.—*Australia.*

Names of Places.	Year of Observation.	Magnetic Variation.
Amboyna,	Oct. 1823	0 28 E.
Bouroa, Cayeli,	Sep. 29, 1823	8 31·8 E.
Ceram, Selema Bay,	July 1796	8 41 E.
Dory Harbour, N. G.	—— 1824	1 35·6 E.
Galapagos Island,	1821	8 20 E.
Guaxon, Marian Isl.	Feb. 22, 1792	3 16 E.
Jervis Bay,	1800	9 0 E.
King's I. Elephant B.	1802	3 30 E.
Manilla,	July 18, 1792	0 17½ E.
Manava Port, N. Zeal.	Apr. 1824	13 21·6 E.
N. Caledonia,		
Port S. Vincent,	1803	10 56 E.
Oyster Bay, New Hol.	1789	6 40 E.
Otaheite Point,	May 1823	6 40·4 E.
Offak,	Sep. 1823	1 1·7 E.
Port Praslin,	Aug. 1823	6 40·4 E.
Pulo Leah,	Mar. 1, 1816	0 52½ W.
Pulo Penang,	1787	0 11 W.
Port Cornwallis,	1809	1 57 E.
Port Philip,	1802	8 0 E.
Port Jackson,	Mar. 18, 1793	8 46 E.
	Jan. Feb. 1824	8 56
Paramatta,	Oct. 23, 1822	8 43·8 E.
	Feb. 10, 1813	0 46·8
	Mar. 26, ——	0 47·5
	Mar. 27, 1813	8 50·5
	—— 31, ——	0 43·5
Halan,		
Havre de la Coquille,	June 1823	9 20·5 E.

On the progressive Changes in the Variation of the Needle.

Change in the variation.

We have already seen that the variation of the needle experiences a progressive change in every part of the globe. The following table shows very satisfactorily the change which has taken place in London.

Table of the Variation at London from 1576 *to* 1831.

Years.	Observers.	Variations.	
1576	Norman	11° 15′	easterly.
1580	Burroughs	11 17	maximum.
1622	Gunter	6 12	
1634	Gellibrand	4 5	
1657 1662		0 0	No variation.
1666		0 34	westerly.
1670		2 6	
1672		2° 30′	westerly.
1700		9 40	
1720		13 0	
1740		16 10	
1760		19 30	
1774		22 20	
1778	*Phil. Trans.*	22 11	
1790		23 39	
1800		24 36	
1806	*Phil. Trans.*	24 8	
1813	Col. Beaufoy	24 20 17″	
1815	Ditto	14 27 18	maximum.
1816		24 17 9	
1820		24 11 7	
1823		24 9 40	
1831		24 0 0	

The following table shows the progressive change in the variation of the needle at Paris.

Table of the Variation at Paris from 1541 to 1829.

Years.	Variations.	Years.	Variations.
1541	7° 0′ easterly.	1683	3° 50′ westerly.
1550	8 0	1700	7 40
1580	11 30 maximum.	1750	17 15
1603	8 45	1767	19 16
1618	8 0	1780	20 35
1630	4 30	1785	22 0
1640	3 0	1800	22 12
1659	2 0	1807	22 34
1664	0 40	1814	22 54
1669	0 0 No variation.	1819	22 29
1667	0 15 westerly.	1824	22 23
1670	1 30	1829	22 12·5 Arago.
1680	2 40		

The following table shows the progressive change in the variation in the southern hemisphere since the time of Vasco de Gama.

Table of the Variation at the Cape of Good Hope.

Years.	Variations.	Years.	Variations.
1605	0° 30′ easterly.	1724	16° 27′ westerly.
1609	0 12 westerly.	1752	19 0
1614	1 30	1768	19 30
1667	7 15	1775	21 14
1675	8 30	1791	25 40 maximum.
1702	12 50	1804	25 4

Professor Hansteen has explained these progressive changes in the variation of the needle by the motion of the four magnetic poles. Taking the variations at Paris for the northern hemisphere, he remarks that in 1580 the weak north pole in Siberia was about 40° east of Greenwich, or to the north of the White Sea, while the strong American pole was about 136° west of Greenwich, or 36° east of Behring's Straits. The west pole, therefore, lay *nearer* Europe than now, and the strong one *more remote.* Hence the action of the former predominated, and drew the needle eastward. But the *weak* pole now withdrew itself towards the Siberian Ocean, from Europe, and the *strong one* approached it. The action of the latter therefore predominated, and the needle turned westward till 1814, when it reached its greatest declination, and commenced its easterly course.

The explanation is equally satisfactory in reference to the southern hemisphere, and the variation at the Cape. In 1605 the *weak* south pole was 76½° west of Greenwich, and the *strong* south pole about 150° east of that meridian. The weak pole was, therefore, much *nearer* the Cape than now, while the stronger pole was *more remote* from it. The influence of the *weak* pole was therefore most powerful, so that the south pole of the needle moved towards the west, and its north pole more towards the east. But when the *weak* south pole receded from the Cape, and the *strong* one approached it, the south pole of the needle turned more and more towards the strong pole, and its declination became consequently more westerly.

Mr Barlow has therefore given the following rule for calculating the variation of the needle, on the supposition that the magnetic pole which governs the needle in London was in 1818 in north latitude 75° 2′, and west longitude 67° 41′, and that its motion was uniform at the rate of 4° 14′ in *ten* years, the variation being 0°, or the pole being in the meridian of London, in 1660.

Rule. To the co-tangent of half the angle πNL (see the last figure), add the constant log. 1·65642; find the angle of which the sum is the tangent, and call it arc (A). To the same co-tangent add the log. 0·03987, and find the arc of which the sum is the tangent, and call it arc (B). Then B — A will be the variation, or the angle πLN. The following comparison of the variations thus computed with actual observation is very interesting.

Years.	Variations.		Differences.	Observers.
	Observed.	Computed.		
1660	0° 0′	0° 0′	0° 0′	Bond.
1670	2 30	2 44	0 14 +	Halley.
1690	6 0	7 59	1 59 +	Ditto.
1720	14 17	14 47	0 30 +	Graham.
1740	17 0	18 20	1 20 +	Ditto.
1750	17 48	19 47	1 59 +	Ditto.
1770	21 9	22 4	0 55 +	Heberden.
1780	23 17	22 54	0 23 —	Gilpin.
1790	23 39	23 33	0 6 —	Ditto.
1800	24 3	24 1	0 2 —	Ditto.
1810	24 11	24 18	0 7 +	Ditto.
1818	14 30	24 30	0 0	
1828		24 29		
1833		24 26		

The numbers in the column of differences are very small, and may arise as much from errors of observation as from a defect in the theory. The average difference is only about 45′.

Mr Barlow has computed the variation also for Paris and Copenhagen, and compared it with the best observations made at these places. The average difference for Paris is less than 30′. At Copenhagen it is 37′, or only 20′ if we throw aside the observed variation for 1731, which seems to err greatly in defect.

On the Annual Variation of the Needle.

Annual variation. Cassini.

Besides the progressive changes in the declination of the needle, M. Cassini observed an *annual* change, depending on the position of the sun in reference to the equinoctial and solstitial points.

Between the months of *January* and *April* the magnetic needle recedes from the north pole of the globe, so that its western declination increases.

From *April* to the beginning of *July*, that is, from the vernal equinox to the summer solstice, the declination diminishes, or the needle approaches the north pole of the globe.

From the summer solstice to the vernal equinox, the needle, receding from the north pole, returns to the west, so that in October it has nearly the same position as in May, and between October and March the western motion is smaller than in the three preceding months.

Hence it follows, that during the *three* months between the vernal equinox and the summer solstice, the needle retrogrades towards the east; and during the following *nine* months its general motion is towards the west.

Arago.

This important subject has particularly occupied the attention of M. Arago. Taking the mean declination of each day, or that of the maximum and minimum, and the mean declination of each month, he has arranged in tables the mean monthly declinations at Paris from 1784 to 1788, and also those at London, near the equinoxes and solstices, from 1793 to 1805, as calculated from the observations of Mr Gilpin, and, by a comparison of the results, he finds a maximum of declination towards the vernal equinox, and a minimum towards the summer solstice; but this difference was less at London than at Paris.

In comparing the observations of Cassini in 1786 with those of 1800, corresponding to the measures of Gilpin, M. Arago has found that they do not differ from one another in their magnetical relations, but in one point. In 1786 the annual change of declination was nine minutes, whereas in 1800 it was scarcely a minute. Hence, says he, it is worthy of remark, that the retrograde motion which the needle experiences between the vernal equinox and the summer solstice decreases at the same time with the general and annual motion towards the west.

At Salem in Massachusetts, where observations were made in 1810 by M. Bowditch, the declination is west, and has diminished for a great number of years about two minutes annually. In examining these observations, M. Arago does not find any trace of the period of Cassini. The declination has never diminished between the vernal equinox and the summer solstice, but it gradually increases from April to August. This increase is compensated by a decrease of the declination between September and December, so that the period seems to be transferred from spring to autumn. If this idea shall be found correct, M. Arago conceives that the annual changes will be regulated by the following principles.

1. When the needle, having a westerly declination, recedes from the meridian, it experiences a retrograde motion, which brings it back to this place. This is the discovery of Cassini.

2. This retrograde oscillation is greater in proportion as the annual change of declination is greater; a result deducible from a comparison of Cassini and Gilpin's observations.

3. The oscillation disappears, and every month gives nearly the same mean declination, when, the needle having arrived at the limit of its western digression, the annual change of declination becomes nothing. This result is deducible from Colonel Beaufoy's observations.

4. When the westerly declination diminishes from year to year, no remarkable oscillations are observed in the needle towards the east, excepting between the months of September and December. This is the observation of Mr Bowditch. According to Colonel Beaufoy's observations, the daily variation is greatest in *June* and *August*, and less in July, so that the annual curve has two *maxima* and two *minima* in the course of the year, the two maxima being in June and August, and the two minima in December and July.

On the Diurnal Variations of the Needle.

Diurnal variation.

That there is a daily change in the variation of the needle, as originally discovered by Mr Graham in 1724, has been placed beyond a doubt by observations made with the most accurate instruments in almost every part of the world. The following table contains the mean diurnal changes in the variation, according to the observations of Canton in 1759, of Gilpin in 1787 and 1793, and of Colonel Beaufoy in 1817–19.

Table of the Mean Daily Changes in Variation.

Months.	Observations of Canton. 1759.	Observations of Gilpin.		Colonel Beaufoy. 1817–18–19.
		1787.	1793.	
January	7′ 8″	10′ 2″	4′ 3″	5′ 3″
February	8 58	10 4	4 6	6 3
March	11 17	15 0	8 5	8 22
April	12 26	17 4	11 7	11 48
May	13 0	18 9	10 4	9 53
June	13 21	19 6	12 6	11 15
July	13 14	19 6	12 5	10 43
August	12 19	19 4	12 1	11 26
September	11 43	15 5	9 8	9 44
October	10 36	14 3	7 0	8 46
November	8 9	11 1	3 8	7 10
December	6 58	8 3	3 8	4 7
Mean daily change	10 43	14 39	8 0	9 32

The following Table shows the Amount of the Daily Variation at other Places compared with that at London.

London, general mean	60′	44″	
Geneva	15	42	Saussure.
Chamouni	17	6	
Col du Geant	15	43	
Freiberg	12	11·9	
Petersburg	12	10·1	
Nicolajef	10	53·4	
Kasan	70	36·5	

When the diurnal variation of the needle was first discovered, it was supposed to have only two changes in its movements during the day. About seven A. M. its north end began to deviate to the west, and about two P. M. it reached its maximum westerly deviation. It then returned to the eastward to its first position, and remained stationary till it again resumed its westerly course in the following morning. When magnetic observations became more accurate it was found that the diurnal movement commences much earlier than seven A. M. but its motion is to the east. At half past seven A. M. it reaches its greatest easterly deviation, and then begins its movement to the west till two P. M. It then returns to the eastward till the evening, when it has again a slight westerly motion; and in the course of the night, or early in the morning, it reaches the point from which it set out twenty-four hours before. The most accurate observations made in England were those of Colonel Beaufoy, when the variation was about 24½ west. In these the absolute maxima were earlier than in Canton's observations, and the second maxima west about eleven P. M.

The following were the diurnal changes observed at Paris. During the night it is nearly stationary. At sunrise its north extremity moves to the westward, as if it were avoiding the solar influence. Towards noon, or more generally from noon to three o'clock, it attains its maximum westerly deviation, and then it returns eastward till nine, ten, or eleven o'clock in the evening; and then, having reached its original position, it remains stationary during the night. The amount of this daily variation is, for April, May, June, July, August, and September, from 13′ to 15′, and for the other six months of the year from 8′ to 10′. On some days it rises to 25′, and on others it does not exceed 5′ or 6′.

According to M. Dove, the maximum easterly deviation of the needle takes place at eight A. M. at Freiberg, Nicolajef, and St Petersburg, and at nine A. M. at Kasan; and the maximum of westerly deviation at two P. M. at Kasan, Nicolajef, and St Petersburg, and at one P. M. at Freiberg.

In the northern regions, such as Denmark, Iceland, and Greenland, the diurnal variations are greater, and less regular. The needle is not stationary during the night, and it does not reach its maximum westerly deviation till between eight and ten P. M., and its most easterly about nine or ten A. M.

In advancing from the north to the magnetic equator, the diurnal variation diminishes in amplitude, and it ceases to be perceptible in the magnetic equator. Captain Duperrey, however, has found, that when the place is either under the magnetic equator, or at a little distance from it, the north point of the needle advances every morning to the *west* or to the *east*, according as the sun passes to the *north* or to the *south* of the place of observation.

In the southern magnetic hemisphere the daily variation takes place in an opposite manner, the *north* end of the needle moving to the east at the same hours that it did to the west in the northern hemisphere; a result which has been established by the observations of Mr J. Macdonald at St Helena, and at Fort Marlborough in Sumatra.[1] M. Mr Macdonald observes, that the diurnal variations are sensibly less between the tropics than in Europe.

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[1] Made in 1794, 1795, and 1796; see *Philosophical Transactions.*

Freycinet was led to the same result by observations made in the Isle of France, Timor, Rawak, Guham, Mowi, Port Jackson, and other places. At the Marianne and Sandwich Isles, in the northern hemisphere. the *north* point of the needle moves to the west, as in Europe, from eight A. M. till one P. M. though the variation there is easterly. At Timor, Rawak, and Port Jackson, to the south of the equator, the north point of the needle moves during the morning in an opposite direction; hence the observations made to the north of the line agree with those in Europe, while those in the southern hemisphere, like those of Macdonald, exhibit an opposite motion. M. Freycinet found that the diurnal oscillations have a small amplitude between the tropics. At Rawak, only the fortieth of a degree south of the equinoctial line, M. Freycinet found that the needle oscillated every day with an amplitude of 3′; so that it is the magnetic, and not the terrestrial, equator, as Duperrey afterwards found, which separates the zone of westerly from the zone of easterly diurnal variations.

Observations are still wanting to show whether or not the daily variations have the same direction in places where the variation is westerly and in those where it is easterly.

The dipping needle also undergoes, as will be afterwards seen, daily variations, but their amplitude is of less amount. There can be no doubt, as M. Pouillet observes, that a needle capable of moving in any given azimuth will experience daily changes; and that a needle moveable in every direction round its centre of gravity would describe every day a cone whose base would be an ellipse, or some other curve more or less elongated, in different parts of the earth.

Cause of the diurnal variation.

The sun is now universally allowed to be the cause of the diurnal variations of the needle. Canton ascribed them to the action of solar heat, having ascertained that heat tends to diminish the attractive powers of a magnet, and assuming that the direction of the needle was due to the resultant of all the magnetic forces of the terrestrial sphere. When the sun was to the eastward of the needle, the forces lying to the eastward suffered a diminution of power, in consequence of which the westerly force prevailed, and the north end deviated to the west. When the sun, on the other hand, was to the westward of the needle, the power on that side diminished, and the needle returned again to the eastward. Canton, however, did not give any explanation of the morning easterly variation of the needle.

On the Irregular Motions of the Magnetic Needle as produced chiefly by the Aurora Borealis.

Irregular motions of the needle produced by the aurora borealis.

Besides the regular changes of an annual and diurnal nature to which the needle is subject, it is sometimes affected with sudden and extraordinary movements, to which Baron Humboldt has given the name of *magnetic hurricanes*, during which the needle traverses with a shivering motion, and often oscillates several degrees on each side of its mean position.

These sudden and capricious motions have been most frequently observed during the existence of the *auroræ boreales*, and have therefore been ascribed to that cause. The influence of this meteor on the magnetic needle was first noticed by Wargentin in 1750. It was observed by Bergman and others; and Van Swinden remarks, that he seldom failed to observe auroræ boreales after any anomalous motion of the needle; and he always concluded that there must have been one at the time, though he did not see it. As needles made of other substances, such as copper or wood, have not been found to be affected, the action of the aurora cannot be considered as an electrical one.

Dr Dalton's observations.

The influence of the aurora on the needle has been particularly studied by Dr Dalton, who has stated his views in his *Meteorological Observations and Essays*, published in 1793, in a dissertation of great ability, which has never received the notice which it merits. He has shown that the luminous beams of the aurora are parallel to the dipping needle; that the rainbow-like arches cross the magnetic meridian at right angles; that the broad arch of the horizontal light is bisected by the magnetic meridian; that the boundary of a limited aurora is half the circumference of a great circle crossing the magnetic meridian at right angles, the beams perpendicular to the horizon being only those on the magnetic meridian.

Dr Dalton has shown, from numerous observations, that the aurora exercises an irregular action on the magnetic needle; and he has deduced from these observations the following results:

1. When the aurora appears to rise only about 5°, 10°, or 15° above the horizon, the disturbance of the needle is very little, and often insensible.

2. When it rises up to the zenith, and passes it, there never fails to be a considerable disturbance.

3. This disturbance consists in an irregular oscillation of the horizontal needle, sometimes to the eastward and then to the westward of the mean daily position, in such sort that the greatest excursions on each side are nearly equal, and amount to about half a degree each at Kendal.

4. When the aurora ceases, or soon after, the needle returns to its former station.

Professor Hansteen's observations on the magnetical influence of the aurora are peculiarly interesting. He states, that the extraordinary shivering movements of the needle are perhaps never exhibited except when the aurora is visible; and that this disturbance seems to operate at the same time in places the most widely separated. The extent of these movements may in less than twenty-four hours amount to five or five and a half degrees. In such cases, he adds, the disturbance is also communicated to the dipping needle; *and as soon as the crown of the aurora quits the usual place (the points where the dipping needle produced would meet the sky), that instrument moves several degrees forward*, and seems to follow it. After such disorders, he continues, the mean variation of the needle is wont to change, and not to recover its previous magnitude till after a new and similar disturbance. During the continuance of the aurora borealis, the intensity of the earth's magnetic force seems to grow weaker; for which reason the needle recedes from that magnetic pole where the ray of the aurora is displayed.

The influence of the aurora borealis on the needle has been studied with particular care by M. Arago, whose accurate and regularly continued series of observations on the daily changes of the magnetic needle at Paris has enabled him to compare these changes with the occurrence of the northern light. The following is an abstract of his views on the subject: The appearance of an aurora causes the magnetic needle to vary several degrees to the east and west of its mean position. In the region were it appears, luminous beams, differently coloured, shoot up from all points of the horizon; *and the part of the heavens where all these beams or radiations unite is precisely that to which a magnetic needle directs itself when suspended by its centre of gravity.* M. Arago has also shown that the concentric circles, which show themselves almost always before the luminous beams, rest each upon the two points of the horizon equally distant from the magnetic meridian, *and that the most elevated points of each arch are exactly in this meridian.* From these two facts he concludes that there is a relation between the causes of the aurora borealis and the motions of the magnetic needle; and, from observations made in places remote from each other, he infers that the aurora acts even before it shows itself in the horizon, and that its influence is exerted at very considerable distances. In a subsequent paper on the subject, M. Arago shows that the auroras

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which are visible only in America, at St Petersburg, and in Siberia, in spite of the immense distance which separates us from these regions, produces a perceptible derangement of the magnetic needle at Paris. M. Arago at first believed that even the auroras of the southern hemisphere extended their influence to Paris; but he has since found, that on the days when these southern auroræ took place, the phenomenon was observed also in the north, so that no conclusion can be properly deduced from this coincidence with the observed derangements of the needle.

M. Kupffer has confirmed by his own observations the first results obtained by M. Arago, and is of opinion that the aurora extends its influence to a great distance. When the needle was driven from its mean position by the influence of this meteor, M. Kupffer could not perceive any sensible difference between the duration of an oscillation at this time and at any other. He has, however, excepted some cases where the deviation was very considerable; but what was very remarkable was, that when the needle deviated to the east, the duration of an oscillation was greater than usual, whilst on the 24th November 1825, when the needle deviated to the west, the duration of an oscillation was smaller. On the other hand, the dip being in the ratio of the duration of the oscillation, the preceding observations seem to prove that the dip diminishes when the needle deviates to the west, and increases with an easterly deviation.

Notwithstanding the body of evidence which proves the connection between the aurora and the derangement of the needle, it is a very remarkable fact, that during the frequent occurrence of that meteor at Port Bowen, Captain Foster did not observe any peculiar changes in the deviation of the needle, although, from his vicinity to the magnetic pole, the diurnal variation sometimes amounted to 4° or 5°, and it was to be presumed that the slightest action of the aurora would, under such circumstances, have been visible. From these observations of Captain Foster and others, the natural conclusion is, that there are some auroræ which do not disturb, while there are others which do disturb, the magnetic needle.

During Captain Back's residence at Fort Reliance (north latitude 62° 46′ 29″, and west longitude 109° 0′ 39″) for *six* months in 1833–4, and *four* months in 1834–5, the aurora occurred almost every night. The magnetic needle seems to have been constantly affected by it, and on one occasion the effect exceeded *eight degrees.* "Brilliant and active coruscations of the aurora borealis," says Captain Back, "when seen through a hazy atmosphere, and exhibiting the prismatic colours, almost invariably affected the needle. On the contrary, a very bright aurora, though attended by motion, and even tinged with a dullish red and a yellow, in a clear blue sky, seldom produced any sensible change, beyond, at the most, a tremulous motion.

"A dense haze or fog, in conjunction with an active aurora, seemed uniformly favourable to the disturbance of the needle; and a low temperature was favourable to brilliant and active coruscations. On no occasion, during two winters, was any sound heard to accompany the motions. The aurora was frequently seen at twilight, and as often to the eastward as to the westward. Clouds, also, were often perceived in the day time, in form and disposition very much resembling the aurora."

Mr Christie has explained the absence of any apparent action of the aurora, by the supposition that the apparatus employed was not fitted to exhibit that action; and he entertains therefore the opinion, "that changes in the deviation and intensity of the terrestrial forces are simultaneous with the aurora borealis." The following is the method recommended by Mr Christie for observing the effects of the aurora to the greatest advantage:

"If the magnetic forces brought into action during an aurora are in the direction of the magnetic meridian, they will affect a dipping needle adjusted to the plane of that meridian; but the direction of an horizontal needle will remain unchanged. On the other hand, if the resultant of these forces makes an angle with the meridian, the direction of the horizontal needle will be changed, but the dipping needle may not be affected. In order to determine correctly the negative influence of the aurora, by means of an horizontal needle, it is therefore necessary not only to have regard to those forces which influence its direction, but likewise to those which affect the horizontal intensity. The effects of the former are the objects of direct observation, but those of the latter are not so immediately observable. As, during an aurora, the intensity may vary at every instant, and it is these changes which are to be detected, the method of determining the intensity by the time of vibration of the needle cannot here be applied, and other means must be adopted. The best method appears to me to be that which I employed for determining the diurnal variation of the horizontal intensity, the needle being retained nearly at right angles to the meridian by the repulsive force of a magnet, or by the torsion of a fine wire or thread of glass. For the purpose, then, *of detecting, in all cases, the magnetic influence of the aurora*, I consider that two horizontal needles should be employed; one adjusted in the meridian, for determining the changes which may take place in the direction of the horizontal force, and the other at right angles to the meridian, to determine the changes in the intensity of that force, arising principally from new forces in the plane of the meridian, and which would affect the direction of the dipping needle alone. Both these needles should be delicately suspended, either by very fine wire, or by untwisted fibres of silk. In order to render the changes in the direction of the needle in the meridian more sensible, its directive force should be diminished by means of two magnets north and south of it, and having their axes in the meridian. These magnets should be made to approach the needle until it points about 30° on either side of the meridian, and they should be so adjusted that the forces acting upon the needle will retain it *in equilibrio*, with its marked end at about 30° to the east and 30° to the west of north, and also at south. The needle is to be left with its marked end pointing south, for the purpose of observing the changes occurring in its direction. If magnets are employed to retain the second needle nearly at right angles to the meridian, they should be made to approach its centre until the points of equilibrium are at about 80° east, 80° west and south, the observations being made with the needle at 80° east and 80° west. An objection to this method of adjusting this needle by means of magnets is, that any change in their temperature will have a very sensible effect on the direction of the needle in this position; and should such change take place during the observations, corrections must be applied to the results before any accurate conclusions can be drawn from them. I have before remarked, that this inconvenience will be in a great measure obviated by employing the torsion of a fine wire, or a very fine plummet of glass, to retain the needle at about 80° from the meridian. In this case, the ratio of the force of torsion to the terrestrial force acting upon the needle having been determined, a measure will be obtained of the changes which take place in the intensity of the terrestrial force during the occurrence of an aurora. It is very desirable that it should be ascertained whether the effects on the needle are simultaneous with any particular class of phenomena connected with the aurora; whether these effects are dependent on the production of beams or coruscations, or on the formation of luminous arches; or whether any difference exists in the effects produced by them. In order to determine this, it is necessary that the times of the occurrence of the different phenomena, and also of the changes in the directions of the needles, should be accurately noted; and for such observations three observers appear to be indispensable."

It has become a question of some importance, whether the electric state of the clouds produces any effects upon the needle: and this question has increased in interest since the discovery of the magnetical effects of galvanic and common electricity. Mr Christie has made some valuable observations on this subject. Adjusting in a particular manner a needle between two magnets, so that its directive force was considerably diminished, he found that changes in the position of electric clouds were accompanied by changes in the position of the needle. Captain Sir Everard Home also observed, that, in two instances, a vibrating needle came sooner to rest during a thunder storm than it did either before or after it. The number of vibrations was reduced in one case from 100 to 40, and in another from 200 to 120.

An analogous fact was observed by Captain Back, in 1833, at Fort Alexander, at the southern extremity of Lake Winnipeg, where a "considerable alteration appeared, both in the number of vibrations, and the point at which the needle finally rested. A second time showed a similar discrepancy. The reason of this peculiarity I could not divine, until about an hour afterwards, when some gentlemen arrived from the westward, and acquainted us that they had just encountered a severe thunder shower, though the sky over the fort underwent no visible change, and wore the same sultry aspect as it had done most of the forenoon."[1]

The view which we have given, in a subsequent section, of the magnetic condition of our atmosphere, arising from the uniform dissemination of ferruginous and other metallic matter, enables us to give a satisfactory explanation of the general phenomena of the aurora, of its action on the needle, and of the circumstances under which it will affect or not affect its stability. That there is magnetic matter in the atmosphere is indubitable, and that this matter may be heated by the electricity of the atmosphere, so as to give out light of different colours, and may have its magnetic influence increased or diminished by this electrical action, as well as by ordinary changes of temperature, cannot be doubted. When the magnetic forces are in a state of equilibrium, the needle will take its mean position, subject only to those diurnal changes which arise from the action of solar heat. But when the magnetic matter is exposed to the electrical agents which exercise so powerful an influence on the regions of the clouds, when the ferruginous matter, and the other metallic vapours which accompany it, are rendered luminous by the transmission of the electric fluid, and when the the magnetic matter has its induced magnetism either diminished or increased by this cause, the resultant of the forces which act upon the needle must be changed, and motions regular and irregular, easterly and westerly, or in any given direction, communicated to a needle freely suspended by its centre of gravity. A local displacement of the magnetic matter, by the various causes which are constantly disturbing our atmosphere, or local and limited electric action, must necessarily affect such a needle; but it is easy to conceive that those local and limited actions may be such as to balance each other, and not change the direction of the resultant force which acts either upon a horizontal or a dipping needle. Nay, it is easy to conceive a general diffusion of electricity, capable of illuminating the magnetic matter with such perfect equality in all magnetic azimuths, without at all affecting any needle, however balanced or suspended; because the electrical influence may not change the direction of the resulting forces which give the needle its mean direction. In such a case, however, it is probable that the magnetic intensity might be increased or diminished during the existence of such an electric state of the magnetic matter. We cannot, therefore, adopt the opinion of Mr Christie, *that every aurora must disturb the magnetic needle;* and we admit only the observed fact, that there are auroras which disturb, and auroras which do not disturb, the needle.

In order to explain more fully our views on this subject, let us suppose our magnetic atmosphere to be undisturbed by any cause, and that the needle in every magnetic meridian rests in a state of perfect equilibrium in its mean position. Let us now suppose that the magnetic atmosphere is disturbed in east longitude 90° and latitude 0°, either by a change of temperature, or by electric action, or by any cause which displaces the magnetic matter from that meridian, or accumulates it there. Such a change must necessarily affect the horizontal magnetic needle in all places to the east and west of it; but it will not affect the horizontal needle in the meridian where it takes place, or in the opposite meridian, as the resultant of the magnetic forces, though they may be changed in intensity, will not be changed in direction. In like manner, if various discharges take place simultaneously or successively, there will be certain places where the direction of the resultant forces is not changed, and other places where the change of direction is a maximum. An universally suspended needle, however, will have its direction always changed, unless when the disturbing cause is in the direction of its axis, or in a plane perpendicular to that axis. Hence, then, it is easy to understand (nay, the fact is a necessary result of our hypothesis) why there are auroras which disturb and auroras which do not disturb the needle, why distant auroras affect it when nearer ones do not, and why the needle is in a shivering or constantly oscillating state during auroras in which the places where the magnetic atmosphere is disturbed are constantly changing. In the same manner, we may account for the influence on the needle, observed by Sir Everard Home and Captain Back, during the prevalence of a thunder storm, while the electricity of the atmosphere destroys by its action the magnetic equilibrium, when this action is not compensated by an equal one on the opposite side of the magnetic meridian. When such a compensation takes place, the needle will not deviate from its mean position, though the number of its vibrations in a given time may be altered.

Among the other causes which have a tendency to disturb the magnetic needle, we may enumerate earthquakes and volcanic eruptions, all of which are accompanied in general with electrical phenomena. In 1767, Daniel Bernoulli observed the dip of the needle to diminish half a degree during an earthquake; and De la Torre observed changes of several degrees in the variation of the needle during an eruption of Vesuvius.

SECT. II.—*On the Dip or Inclination of the Needle.*

Dip of the needle.

The dip or the inclination of the needle is, as we have already had occasion to observe, the angle which a well-balanced needle forms with the horizon after it is rendered magnetic, and when it has the power of free motion in the plane of the magnetic meridian, as shown in Plate CCCXXV. fig. 9, where NS is the needle balanced on a horizontal axis, at right angles to its length.

The dip of the needle, like the variation, has different values in different parts of the globe; generally speaking, being nothing, or horizontal, near the equator, and 90°, or perpendicular to the horizon, at the magnetic poles. The line passing round the globe near its equator, in every part of which the dip is nothing, is called the *magnetic equator*, which is a very irregular line, crossing the equator at *four* points, as shown in the annexed figure, where the black line E E is the real equator, and the dotted line MMM the magnetic equator, which is seen to cross the other at four points, in place of two.

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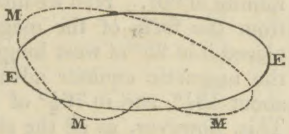
[1] *Narrative of the Arctic Land Expedition*, &c. p. 41, 42.

Fig. 49.



The general inclination of the magnetic to the terrestrial equator is about 12°, its principal intersections or nodes being placed in 113° 14′ west longitude and 66° 46′ east longitude from Greenwich; and it is a tolerably regular line throughout one half of its circumference in the Atlantic and Indian Oceans. In discussing the observations made by Cook and others in the South Sea, M. Biot has shown that the above elements are incorrect everywhere beyond the western node, between 115° and 270° west longitude; and he concludes that between 256° and 158° 50′ of west longitude it again cuts the terrestrial equator at least once, which renders it necessary that it cut it another time near the east coast of Asia, provided it is found in the Atlantic Ocean or the south latitude. Hence there will be at least three nodes, and perhaps four, as shown in the preceding figure. This singular inflexion of the magnetic equator in the South Sea has been confirmed by the more recent observations of M. Freycinet.

The exact position of these nodes, and the true form of the magnetic equator, have been determined with great care by M. Morlet and M. Hansteen. There are some slight differences between their results, which have been pointed out by M. Arago, in the following excellent summary of the results of their inquiry. Both Morlet and Hansteen place the magnetic equator wholly to the south of the terrestrial equator, between Africa and America; its greatest southern latitude being at 25°, one node is in Africa, in about 22° of east longitude, or in 18° according to Morlet. In setting out towards the east from this node, which is nearly in the centre of that part of the African continent, the magnetic equator advances rapidly to the north of the terrestrial equator, quits Africa a little to the south of Cape Guardafui, and in the Arabian Sea it attains its most northerly latitude of about 12°, in 62° of east longitude. Between this meridian and 174° east, the magnetic equator is constantly to the north of the equinoctial line. It cuts the Indian peninsula a little to the north of Cape Comorin, traverses the Gulf of Bengal, making a slight advance to the equinoctial, from which it is only 8° distant at the entry of the Gulf of Siam. It then re-ascends a little to the north, almost touches the north point of Borneo, traverses the isle of Paragua, the strait which separates the most southern of the Philippines from the isle of Mindanao, and under the meridian of Naigiou it again reaches the north latitude of 9°. From this point it traverses the archipelago of the Caroline Islands, and descends rapidly to the equinoctial line, which it cuts, according to Morlet, in 174°, and according to Hansteen in 187°, of east longitude. There is much less uncertainty respecting the position of a second node, also situated in the Pacific Ocean. Its west longitude ought to be about 120°; but while M. Morlet's inquiries lead him to conclude that the magnetic equator merely touches the equinoctial at that point, and then bends again to the south, M. Hansteen makes it cross the line into the northern hemisphere, and continue there through an extent of 15° of longitude, and then return southward, and cross the equinoctial again in about 108° of west longitude, or 23° from the west coast of America. This discrepancy between the deductions of Morlet and Hansteen is, after all, very trivial; for, in the case just mentioned, the magnetic equator does not go more than 1½° to the north of the equinoctial; and, in general, the magnetic equator of Morlet differs in no part so much as 2° in latitude from that of Hansteen.

The magnetic equator thus traced over the globe has a motion from east to west, in so far as can be determined by direct observations on the position of its nodes. The two nodes of Hansteen, corresponding to the tangent node of Morlet, are divided between 108° and 126° of west longitude. In 1819, M. Freycinet found, on board the Uranie, that this node was in 132° of longitude; and Captain Sabine found that the node in Africa, which was far from the coast in 1780, had advanced from east to west even to the Atlantic Ocean. M. Morlet had indicated, with some distrust, this motion of the magnetic equator; and he considered it probable that its form and position regulated the direction of the annual variations of the needle. He found that the dip of the needle diminished wherever the motion of the equator tended to diminish the magnetic latitude, and that it increased, on the contrary, wherever the magnetic latitude was increased; a result which was confirmed by future observations.

Much light has been thrown on the subject of terrestrial magnetism, but particularly on the form and motion of the magnetic equator, by the observations of Captain Duperrey, made on board the Coquille, in the years 1822–1825. This vessel crossed the magnetic equator six times, and M. Duperrey was able to determine directly two of its points, situated in the Atlantic Ocean. On the chart of M. Morlet, and in that of Hansteen, the latitudes of those parts which correspond to the same longitudes are greater by 1° 43′ and 1° 50′; and hence M. Arago has concluded that the magnetic equator has approached the terrestrial equator by the same quantities. In the South Sea, near the coast of America, M. Duperrey has determined two points of the magnetic equator. On the charts of Morlet and Hansteen the latitudes of these points is about a degree smaller, but the difference is in a direction contrary to that which was found in the Atlantic Ocean; from which it follows, that, near the coast of Peru, the magnetic equator has removed from the equinoctial line.

In discussing the magnetic observations made on board the Coquille, M. Duperrey has traced the form of the magnetic equator with an unexpected degree of accuracy; employing the formula of Barlow, which makes the tangent of the magnetic latitude equal to half the tangent of the dip, and making one only of dips which do not exceed 30°. Having obtained the magnetic latitudes of the places where the observations were made, he deduces, both from these and from the variation of the needle at the same place, the changes in longitude and latitude, which, being combined with the geographical positions of the stations, give him the coordinates of the corresponding points of the magnetic equator. By means of this method, and relying only on his own observations, he has traced a portion of this curve through an extent of 247° of longitude, comprehending the Atlantic Ocean, a part of South America, the great equinoctial ocean, and the Asiatic archipelago, as far as the western extremity of the island of Borneo. In prolonging the magnetic equator to the east, he has used the observations of Captain Sabine in 1822, made in the island of St Thomas, in the Gulf of Guinea. Between the west of Borneo and the north of Ceylon, he availed himself of the observations made in 1827, by M. de Blosseville, in the Chevrette. Adopting Captain Sabine's determination of one of the nodes of the magnetic equator, which he places 3° 20′ to the east of the meridian of Paris, not far from the west coast of Africa, M. Duperrey shows that this equator, after resting at this node, rises to the north, traverses Africa, and reaches probably the fifteenth degree of north latitude, in the Red Sea (as appears from an observation made by Pantin in the isle of Socotra in 1776). It then descends a little to the south, to join a point in it fixed by M. Blosseville in the north of Ceylon. From these facts it appears, *that the magnetic equator will meet the equinoctial line only in two points, which are diametrically opposite, the one situated in the Atlantic Ocean, and the other in the great ocean nearly in the plane of the meridian of Paris. When this equator meets only some scattered islands, it recedes only a little from the equinoctial line. When the islands are more numerous, it recedes farther; and it reaches its maximum deviation in both hemispheres only in the two great continents which it traverses. He found also, that between the northern and southern halves of the magnetic equator, there is a symmetry very remarkable, and much more perfect than had been previously believed.* These results are laid down by M. Duperrey in a chart of the equatorial regions, published in the *Ann. de Chimie* for 1830.

The dip of the needle increases on each side of the magnetic equator, and Hansteen has projected the lines of equal dip in his chart already referred to. These lines are nearly parallel to the magnetic equator, till we reach 60° of north latitude, and they then begin to bend round the American magnetic pole, which Commander Ross found to be situated in north latitude 70° 5′ 17″, and west longitude 96° 45 48″, the needle having at this point, in Boothia Felix, lost wholly its directive power, and the dip being 89° 59′, within a minute of 90°. Had we inferred the position of the needle from the form of the magnetic equator, we should have placed it in 25° of west longitude, viz. the meridian in which the magnetic equator advances farthest to the south, or about 13½°, and in 76½° of north latitude, or 90° — 13½°. This, however, as all the arctic observations prove, is not the case; and we are led by the phenomena of the dip, as well as by those of the variation in different points of the globe, to conclude that every place has its own magnetic axis, with its own pole and its own equator, as already stated by Mr Barlow.

The following table contains the best observations on the dip of the needle, as collected by Professor Hansteen:—

Places of Observation.	Dip.	Intensity.
	South.	
Port du Nord	75° 50′	1·5773
Port du Sud	70 48	1·6133
Surrobaya in Java	25 40	0·9348
Amboyna	20 37	0·9532
Lima	9 59	1·0773
Magnetic Equator in Peru	0 0	1·0000
	North.	
Tompenda	3 11	1·0191
Loxa	5 24	1·0095
Cuença	8 43	1·0286
Quito	13 22	1·0675
St Antonio	14 25	1·0871
St Carlos	20 47	1·0480
Popayan	20 53	1·1170
Santa Fe de Bogota	24 16	1·1473
Javita	24 19	1·0675
Esmeralda	25 58	1·0577
Carichana	30 24	1·1575
St Thomas	35 6	1·1070
Carthagena	35 15	1·2938
Cumana	39 47	1·1779
Mexico	42 10	1·3155
Atlantic Sea		
B. 20° 46′ n. L. 41° 26′ w. F.	41 46	1·1779
— 11 0 - — 44 32 —	41 57	1·2617
— 12 34 - — 33 14 —	45 8	1·2300
— 14 20 - — 28 3 —	52 55	1·2830
— 20 8 - — 8 34 —	56 42	1·2510
— 21 36 - — 5 39 —	47 49	1·2617
— 25 15 - — 0 36 —	60 18	1·2830
Portici	60 5	1·2883
Naples	61 35	1·2745
Rome	61 57	1·2642
Vesuv. Crater	62 0	1·1933
St Cruz, Teneriffe	62 25	1·2723
Valencia	63 38	1·2405
Florence	63 51	1·2782
Atlantic Sea		
32° 16′ n. 2° 52′ w.	64 21	1·2938
Barcelona	64 37	1·3482
Marseilles	65 10	1·2938
Nimes	65 23	1·2938
	North.	
Mailand	65° 40′	1·3121
Montpellier	65 53	1·3482
Airola	65 55	1·3090
Turin	66 3	1·3364
Medina del Campo	66 9	1·2938
Lans le Bourg Mont Cenis	66 9	1·3227
Como	66 12	1·3104
St Michel	66 12	1·3488
Lyons	66 14	1·3334
St Gothard	66 22	1·3138
Mont Cenis	66 22	1·3441
Ursern	66 42	1·3069
Altorf	66 53	1·3228
Atlantic Sea,		
37° 14′ n. 3° 30′	67 30	1·3155
38 52 - 3 40	67 40	1·3155
Madrid	67 41	1·3938
Tübingen	68 4	1·3569
Atlantic Sea,		
38° 52′ n. 3° 40′	68 11	1·3155
Ferrol	68 32	1·2617
Paris	69 12	1·3482
Göttingen	69 29	1·3485
Berlin	69 53	1·3703
Carolath	68 21	1·3509
Berlin	68 50	1·3533
Dantzig	69 44	1·3737
London	69 57	1·3697
Ystad	70 13	1·3742
Schleswig	70 36	1·3814
Copenhagen	70 36	1·3672
Odensee	70 50	1·3650
Helsinburg	70 52	1·3782
Kolding	70 53	1·3846
Soroe	70 57	1·3842
Freidrichsburg	70 59	1·4028
Aarhuus	71 13	1·3838
Aalborg	71 27	1·3660
Odensala	71 39	1·3666
Friedrichshaven	71 48	1·3842
Göttenburg	71 58	1·3826
Altorp	72 14	1·3891
	North.	
Korset	72° 24′	1·3735
Quistrum	72 27	1·4070
Skieberg	72 29	1·3725
Elleoen	72 38	1·3340
Helgerone	72 39	1·3980
Soner	72 41	1·3835
Christiania	72 34	1·4195
Ryenberg	72 45	1·4208
Bogstad	72 34	1·4378
Bogstadberg	73 13	1·4195
Nasoden	73 2	1·4517
Bärum	72 44	1·3902
Bolkesjoe	73 15	1·4053
Ingolfsland	73 19	1·4159
Norsteboe	73 33	1·4136
Drammen	73 37	1·3771
Maursäter	73 44	1·4656
Ullensvang	73 44	1·4260
Gran	73 45	1·4221
Köngsberg	73 47	1·4144
Tomlevold	73 50	1·4246
Bekkervig	73 58	1·4114
Vang	73 59	1·4308
Bergen	74 3	1·4220
Moe	74 3	1·4254
Mauristuen	74 4	1·4058
Leierdal	74 6	1·4190
Slidre	74 34	1·4543
Brassa	74 21	1·4471
Davis Straits,		
68° 22′ n. 36° 10′ w.	83 8½	1·6365
Hare Island,		
70° 26′ n. 37° 12′ w.	82 49	1·6406
Baffin's Bay,		
75° 5′ n. 42° 43′ w.	84 25	1·6169
75 51 - 45 26 —	84 44½	1·6410
76 45 - 58 20 —	86 9	1·7052
76 0 - 60 41 —	86 0	1·6885
70 35 - 49 15 —	84 39	1·6837
Magnetic Pole,		
70° 5′ 17″ n. 96° 45′ 48″ w.	89 59	

Terrestrial Magnetism.

The following table contains a series of accurate observations on the dip of the needle, made in 1829, by Baron Humboldt, during his journey to the Uralian and Altaian Mountains, and the Caspian Sea. The dip in the table is the mean of two measures taken with two different needles.

Places.	Longitude East of Paris.			North Latitude.			Dip.		Time of Observation.	
Berlin	11°	3′	30″	52°	31′	13″	68°	30′·7	April	9
Konigsberg	18	19	40	54	42	50	69	25·8	–	17
Sandking	18	47	30	55	42	13	69	39·8	–	20
Petersburg	27	59	30	59	56	31	71	6·7	Dec.	6
Moscow	35	17	0	55	45	13	68	56·7	Nov.	6
Kasan	46	47	30	55	47	51	68	26·7	May	10
Ekatherineburg	58	14	15	56	50	13	69	9·7	July	15
Beresowsk	58	24	15	56	54	0	69	13·2	June	20
Nijne-Taghilks	57	56	15	57	55	0	69	29·8	–	30
Nijne-Tourinsk	57	55	13	58	41	0	70	58·7	July	2
Tobolsk	65	45	0	58	11	43	70	55·6	–	23
Barnoul	81	50	0	53	19	0	68	9·8	Aug.	4
Zmeinogorsk	80	25	0	51	8	0	66	5·5	–	8
Ustkamenogorsk	79	55	0	49	56	0	64	47·6	–	20
Omsk	71	13	0	54	57	0	68	54·2	–	27
Petropawlowsk	66	48	0	54	52	0	68	18·4	–	30
Troitsk	59	13	0	54	5	0	67	14·2	Sept.	3
Minsk	57	44	0	54	58	0	67	40·2	–	6
Zlatooust	57	28	0	55	8	0	67	43·2	–	9
Kyschtim	57	58	0	55	37	0	68	45·9	–	12
Orenburg	52	46	15	51	46	0	64	40·7	–	25
Uralsk	49	2	0	51	11	0	64	19·3	–	28
Saratov	43	44	0	51	31	0	64	40·9	Oct.	4
Sarepta	41	59	0	48	30	0	62	15·7	–	9
Astrakhan	45	45	0	46	21	0	59	58·3	–	20
Birutschicana[1]	45	18	0	45	44	0	59	21·6	–	15
Woronesch	36	54	0	51	39	0	65	12·0	–	27

The following are some of the most recent measures of the dip of the needle:—

	Dip of the Needle.		
Göttingen, June 23, 1832, Gauss	68°	22′	52″
Pekin, June 1831	54	48	9
Point Turnagain, 1821, Franklin	86	56	0
Fort Enterprise, 1821, ditto	86	58	0
Cumberland House, 1821, ditto	84	35	0
Ditto ditto, 1833, Back	80	49	0
York Factory, 1821, Franklin	79	29	0
New York, 1833, Back	73	14	0
Montreal, ditto, ditto	77	49	0
Isle a la Crosse, 1821, Franklin	84	13	0
Ditto, 1833, Back	80	35	0
Fort Chipeweyan, 1821, Franklin	85	23	0
Ditto, 1833, Back	81	52	0
Fort Resolution, 1833, ditto	84	30	0
Fort Reliance, 1834, ditto	84	24	0
Musk ox Rapid, 1834, ditto	86	13	0
Rock Rapid, 1834, ditto	87	54	0
Point Beaufort, 1834, ditto	88	13	0
Montreal Island, 1834, ditto	87	45	0
Point Ogle, 1834, ditto	87	26	0
Edinburgh, Greenhill, 1832, Forbes	71	37	0
Reykiavik, June 3, 1836	70	4	0

On the Progressive Change in the Dip of the Needle.

The dip of the needle, like the variation, undergoes a continual change, increasing in some parts of the world, and diminishing in others. The following table shows the change which has taken place in the dip at Paris from 1671 down to 1829.

Year.	Dip.	Year.	Dip.
1671	75° 0′	1818	68° 35′
1754	72 15	1819	68 25
1776	72 25	1820	68 20
1780	71 48	1821	68 14
1791	70 52	1822	68 11
1798	69 51	1823	68 8
1806	69 12	1824	68 7
1810	68 50	1825	68 0
1814	68 36	1826	68 0
1816	68 40	1829	67 41 Arago.
1817	68 38		

The following table shows the changes of the dip at London since 1720.

Year.	Observed.		Computed.
1720,	74° 42′	Graham.	76° 27′
1773,	72 19	Heberden.	73 40
1780,	72 8	Gilpin.	73 18
1790,	71 53	Ditto.	72 39
1800,	70 35	Ditto.	71 58
1810,			71 15
1818,	70 34	Kater.	70 34
1821,	70 3	Sabine.	
1828,	69 47	Ditto.	69 43
1830,	69 38	Kater.	
1833,			69 21

The last column in the table was calculated by Professor Barlow, by his formula, 2 cotan. πL = tan. dip, or that the tangent of the dip is equal to double the tangent of the magnetic latitude.

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[1] An island in the Caspian Sea.

The progressive variation in the dip of the needle is, as M. Humboldt has shown, the necessary consequence of a change in the magnetic latitude, arising from the motion of the nodes of the magnetic equator modified by the form of this curve; and M. Morlet has applied the same principle to account for the variations of the dip in different parts of the globe.

Humboldt and Arago have endeavoured to deduce the annual diminution of the dip occasioned by the motion of the magnetic equator. By comparing the observations of 1778 and 1810 for Paris, the annual diminution was about 5′, whereas, from those of 1820 and 1825, it appears to be only 3′·3. The observations at Turin from 1805 to 1826 give 3′·5, and those of Florence 3′·3.

Besides the progressive variation of the dip, Hansteen has found, from a series of observations made with a dipping needle by Dollond, that the dip during the summer was about fifteen minutes greater than during the winter, and about four or five minutes greater in the forenoon than in the afternoon.

SECT. III.—*On the Intensity of Terrestrial Magnetism.*

Intensity of terrestrial magnetism.

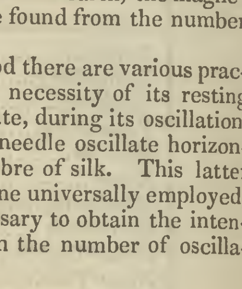
The determination of the intensity of the earth's magnetism at different points of its surface, and of the changes which it undergoes either progressively or at different times of the day and different seasons of the year, has become one of the most important practical problems connected with the physical condition of the globe.

The method of determining this important element by the number of oscillations of the needle was first suggested by Graham, and brought to perfection by Coulomb, Humboldt, and others. If a needle whose axis of suspension passes through its centre of gravity, and which has its north polar and south polar magnetism equal, and similarly distributed, is made to vibrate by turning it from its position, and allowing it to receive that position by a series of oscillations, it is obvious that the earth's magnetism acts with equal force on each half, and that both these forces tend to draw the needle into the magnetic meridian. The greater the magnetic force, the more quickly will the needle oscillate and recover its primitive position. The needle is, in short, in the same circumstances as a pendulum, oscillating by the action of gravity; and, as in this case, the forces are as the squares of the number of oscillations made in the same time.

Let us now suppose, to take the simplest case, that we make the dipping-needle oscillate in the plane of the magnetic meridian, round the line of the dip, and that when the experiment is performed at the equator, the number in a second is 24, while in another place it is 25; then the intensities of the magnetic force at these places is as 25^2 to 24^2, or as 625 to 576, or as 1·085 to 1·000. By carrying the same needle to different parts of the earth, the magnetic intensity at these places will be found from the number of its oscillations.

In the application of this method there are various practical difficulties, particularly the necessity of its resting upon knobs, edges of steel, or agate, during its oscillation, which do not exist if we make a needle oscillate horizontally when suspended by a fine fibre of silk. This latter method has, therefore, been the one universally employed, though a little calculation is necessary to obtain the intensity of terrestrial magnetism from the number of oscillations which are performed.

Fig. 50.



Let NS be a magnetic needle suspended horizontally by a fibre of silk P, and let NC be the line of the dip, or ANC = D the dip itself. Then if F is the force of terrestrial magnetism acting upon the oscillating needle, and tending to bring it to rest, we may decompose this force into two, viz. one, NB, acting in a vertical direction, and which, being counteracted by the suspended force, has no tendency to affect the needle; and the other, NA, acting horizontally, and tending to direct the needle, and cause it to oscillate. This force NA is the cosine of ANC, the dip D. Hence the force NA will be equal to F × cos. D. For any other place where the magnetic intensity is F′ and the dip D′, the effective force will be F′ × cos. D′; and if we call N the number of oscillations made in a second at the first place, and N the number at the second, we shall have $F \times \cos. D : F' \times \cos. D' = N^2 : N^2$, and the ratio of the magnetic intensities at the two places, or $\frac{F}{F'} = \frac{N^2 \cos. D}{N'^2 \cos. D'}$.

In this way observations on the magnetic intensity have been made in almost every part of the world, as shown in the following table, drawn up by Professor Hansteen, and containing observations made principally by himself and his friends. The third column contains the number of seconds in which 300 vibrations of the needle are performed.

Places.		Lat.	Long. from Ferro.	Time of 300 Oscillations.
Berlin		52° 32′	31° 2′	760″·03
Paris		48 50	20 0	753·03
London		51 31	17 34	775·34
Edinburgh		55 58	14 29	820·26
Liverpool		53 22	14 43	801·6
Oxford		51 46	16 24	779·8
Christiansand		58 8	25 43	820·3
Mandal		58 1	25 9	814·3
Tjos				816·3
Carlscrona		56 7	33 13	785·3
Ystad		55 26	31 28	779·3
Szrim		52 7	34 48	748·1
Glogau		51 43	33 36	748·8
Carolath		51 46	33 37	752·7
Zelgos		53 11	32 48	759·7
Dantzig		54 21	36 18	770·4
Marienburg		54 2	36 42	766·0 *
Goslina		52 34	34 43	759·7
Aüstrin		52 35	32 40	762·4 *
Christiania		59 55	28 25	814·76
Friedrichshall	1819	59 8	29 4	821·7 *
	1822			830·3
Quistrum	1819	58 27	29 25	816·1 *
	1820			815·4
Hede		57 58	29 48	810·8
Gottenburg	1819	57 42	29 38	812·2 *
	1820			812·1
Quibille	:	56 47	30 30	791·6 *
Helsingburg	1820	56 3	30 23	791·1 *
	1820			790·0 *
Helfingöer	1820	56 2	30 18	789·8 *
	1820			784·6 *
Copenhagen		55 41	30 15	788·08
Friedrichsburg		55 56	29 58	785·9
Soroe	1820	55 27	29 4	790·6
	1822			790·4
Skieberg		59 14	28 51	826·7
Kongsberg	1820	59 40	27 20	845·4
	1821			839·3
				845·1
				837·8
	1821			859·5
Bolkesjö		59 43	27 0	834·9
Vik				836·8
Tindosen				834·6
Oernäs				829·1
Ingolfsland		59 53	26 28	833·4
Miland		59 56	26 36	833·4
Tind		60 0		835·7
Midböen				836·8
Rögsland				838·0
Nörsteböe		60 20	26 17	839·8
Holmekjärn		60 17	25 24	832·8
Maursäter		60 25	25 3	829·3
Eiford				852·6
Ullensvang		60 20	24 18	840·7
Johnnäs-Tangen				843·8
Gjermundshafen		60 3	23 52	846·2
Kaarevigen		59 45	23 7	838·2
Findas		59 45	22 54	861·7
Siggens				824·2
—				837·4
Folgeröe		59 48	22 56	835·9
Engesund		59 55	22 53	840 7
Beckkervig		60 1	22 50	851·0
Bratholmen		60° 21′	22° 47′	839″·5
Bergen				
Fort Friedrichsberg		60 24	22 57	850·1
Friedrichsberg				850·5
Lunggaards See				849·3
Lyderhorn, 1255 ft.				843·7
Lovstakken, 1524 ft.				904·7
Haugs		60 27	23 18	845·2
Bolstadörn		60 32	22 43	847·7
Evanger		60 33	23 52	845·9
Vossevangen		60 38	24 10	850·6
Tvinde		60 42	24 11	849·1
Staleim		60 52	24 19	848·9
Leirdalsoren		61 10	25 29	856·3
Leirdals		61 8	25 30	852·2
Maristuen		61 2	25 54	855·3
Nyestuen		61 8	25 59	853·2
Vangs		61 6	26 23	845·6
Slidre		61 5	26 49	853·9
Tumlevold		60 51	27 38	843·7
Grans		60 22	28 12	842·3
Moe		60 14	28 11	848·3
Sundvold		60 4	28 7	842·6
Johnsrud		59 57	28 19	841·5
Hurdal		60 26	28 49	827·3
Trogstad		60 8	28 56	823·8
Sunbye	1822	59 36	28 35	826·8
Sooner		59 32	28 25	827·8
				828·1
Boe		59 7	29 7	823·2
Altorp		58 53	29 54	816·3
Oedskjolds-Moen		58 50	29 52	816·0
Elleoen		59 19	28 20	826·7
Godtskjär		57 26	29 43	809·9
Korset		58 49	27 12	824·5
Helegraae		58 59	27 34	822·7
Stubberud		59 4	27 55	818·9
Solerud		59 21	28 9	826·5
Konnerud-Kollen, 1823				875·5
Auestad		59 49	27 53	852·1
Bragernàs		59 49	27 53	848·6
Ravnsborg		59 52	28 17	820·5 *
Friedrichsvärn,	1824	59 0	27 44	813·5
Friedrichshavn		57 27	28 13	808·1
Aalborg		57 3	27 36	806·0
Sporring				799·9
Aarhuus		56 10	27 54	796·0
Hövedkrug				798·3
Weile		55 43	27 12	793·9
Apenrade		55 3	27 6	786·4
Gehlau				787·9
Schleswig		54 31	27 15	783·0
				785·5
Remmels		54 7	27 18	783·0
Elmshorn		53 46	27 18	779·1
Altona		53 33	27 33	776·1
				774·9
Berlin		52 32	31 2	760·4
				759·9
Lubeck		53 51	28 21	776·2
Ploen		54 9	28 6	780·5
Preetz		54 13	27 57	779·0
Kolding		55 27	27 0	789·1
Odensee		55 24	27 59	793·7
Buskerud				845·5
Johnsknuden				961″·3
Skrimfjeld				891·3
Rolloug		59° 59′	27° 5′	844·0
Synhovedet				846·3
Eje		60 6	26 53	838·5
Ejesfjeld				831·2
Daglio		60 18	26 26	837·4
Torpe		60 40	26 47	841·5
Haavi	June	61 7	26 42	851·2
	Sept.			850·4
Urland		61 0	24 55	849·2
Voss	June	60 38	24 10	856·5
	Sept.			845·9
Age-Nuten				842·7
Vigor		60 18	24 5	850·7
Bergen		60 24	22 57	
Nyegaard				857·1
Flöifjeldet				854·7
Lövstakken				844·2
Friedrichsberg				851·7
Lindaas		60 43	23 8	843·5
Evenvig		68 58	23 8	850·6
Yttre-Sulen		61 4	22 45	852·1
Stensund		61 3	22 52	852·9
Pollefjeld				861·8
Askevold		61 24	23 7	861·1
Vilnas		61 22	22 58	860·7
Sougesund		61 22	23 11	861·7
Alden		61 22	22 50	850·7
Bueland		61 17	22 44	851·2
Sveen				856·4
Quamshest				849·8
Forde	July	61 32	23 48	858·9
	Aug.			858·8
Jolster		61 35	24 10	848·6
Gloppen		61 51	24 6	861·9
Indvig		61 49	24 34	860·4
Horningdal		61 59	24 33	862·6
Hälsylta		62 7	24 54	864·8
Nordal		62 18	25 13	870·3
Veblungsnäs		62 31	25 39	868·3
Fladmark				862·9
Nyestuen				862·7
Fogstuen		62 5	27 9	856·9
Jerkin		62 12	27 29	846·5
Foldal		62 7	27 57	855·5
Kongsvold		62 18	27 36	860·0
Drivstuen		62 26	27 41	858·0
Riise		62 31	27 41	858·1
				859·8
Näverdal		62 42	28 6	858·7
Stoa		62 32	28 21	860·4
Gōra		62 35	27 2	862·1
Tofte		61 58	27 10	859·3
Vauge		61 51	27 4	860·8
Vinje		60 52	24 22	848·2
Nyuestuen		61 8	25 59	852·1
Skougstad		61 10	26 12	853·7
Smedshammer		60 29	28 14	841·9
Sundvold		60 4	28 7	839·2
Carlscrona				735
Breslau				741
Stockholm				815
Hernosand				850

The principal intensities computed from these observations will be found in our table of the dip given above.

It is obvious from these data that the magnetic intensity increases from the equator to the poles, and the law of variation is shown in the following table :

Dip of the Needle.	Magnetic Intensity.
0°	1·0
24	1·1
45	1·2
64	1·3
73	1·4
76⅔	1·5
81	1·6
86	1·7

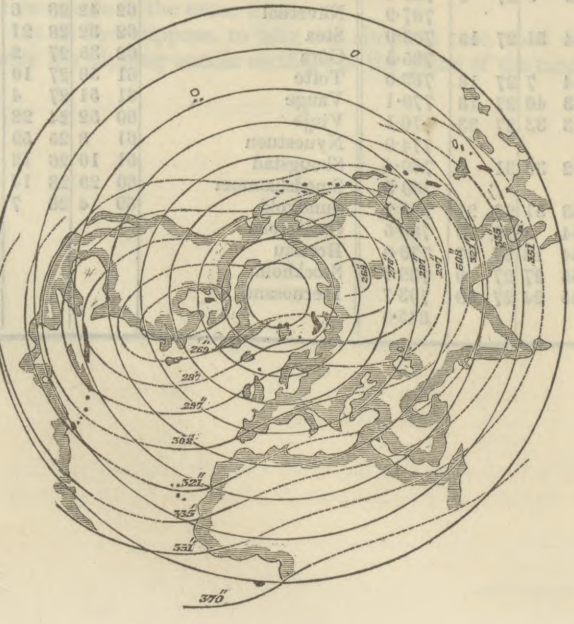
M. Hansteen has projected upon a map of the globe the lines passing through all the places in which the intensity has the same value. These lines he calls *isodynamic lines*, or those of *equal force*, and they are, generally speaking, nearly parallel to each other, and to the lines of equal dip.

Hansteen's observations in Siberia.

Many valuable observations on the intensity of the earth's magnetism were made during the numerous arctic expeditions which were sent out by the British government; but Professor Hansteen being extremely desirous of establishing, by direct observations of his own, the existence of the secondary magnetic pole, which he believed existed in Siberia, set out for this purpose, at the expense of the Norwegian Storthing, and with every encouragement and assistance from the Russian government. The results of this expedition exceeded his most sanguine expectations. The Russian Academy of Sciences have, in consequence of Professor Hansteen's scientific journey, been induced to take a new interest in the subject of terrestrial magnetism, which exhibits such interesting features throughout the Russian empire; and the Russian government has established regular observatories in different parts of its vast dominions, for making magnetical experiments. The Russian empire is actually traversed by *two* lines of no variation, and it is proposed to determine with great precision, every ten years, the exact position of these two lines. Near the first of them, which traverses European Russia, Petersburg, Moscow, and Kasan, are situated; and near the second, which passes through Siberia, is situated Kiachta and Nizni-Oudinsk.

The principal observations made by Hansteen in Siberia have been laid down in a map of the northern hemisphere by Captain Sabine, along with other observations made by himself and Humboldt. In this map, of which the prefixed figure is a copy, it is exceedingly interesting to observe the isodynamic lines surrounding the two northern magnetic poles, and forming a series of returning curves similar to lemniscates, and which may be calculated by the formulæ of Sir David Brewster, already given in the History of Magnetism.

Fig. 51.



In this map the *American* pole is situated nearly in 60° of N. lat. and 80° of W. long.; and the *Asiatic* pole in 60° N. lat. and 100° of E. long. The black lines pass through the places where the magnetic intensity was observed to be equal, and the dotted parts of the same curves indicate the probable direction of the lines where observations have not yet been made. The lines round the American pole are laid down principally from Captain Sabine's observations, and those round the Asiatic pole from the recent observations of Hansteen. The following is the account given of the different isodynamical lines in the figure, by Captain Sabine.

The *first* curve, or that nearest the magnetic poles, is that in which a magnetic needle which performs *n* oscillations in 300″ in London, performs the same number in 269″ round the Asiatic pole. This curve contains a smaller space than the corresponding curve round the American pole, which proves the inferior activity of the former pole. Hansteen traced the south part of this curve below lat. 60°, from the river Jenisei to the 115th degree of W. long., that is, 25° beyond the Jenisei, and to lat. 60°, where it takes a direction almost due north.

The *second* curve, or that in which the same number *n* oscillations are performed in 278 seconds, goes round both the American and Asiatic poles, including both within its area. It passes to the north-west of Melville Island, and to the north-east of some stations on the west coast of Greenland; and it cuts the American coast between the Havannah and New York. Dr Erman, who accompanied Hansteen into Siberia, traced the same curve from the embouchure of the Oby, in N. lat. 68°, and E. long. 70°, following the direction of the river Mina as far as 60° N. lat. The curve here gradually bends to the east, and after passing between Tobolsk and Narym, it was again detected by M. Hansteen at Kainsk, a few degrees to the south of Lake Baikal.

The *third* curve, or that in which *n* oscillations are performed in 287″, is drawn on the American side, from observations made at the Havannah, at the Pendulum Isle on the east coast of Greenland, in N. lat. 74° 5′, and between Spitzbergen and Hammerfest, near the North Cape. This curve, according to Hansteen, enters Europe between Archangel and Nova Zembla; and he met with it again between Moscow and Tobolsk, at 56½° of E. long. and 57½° of N. lat.

The *fourth* curve, or that in which *n* oscillations are performed in 297 seconds, passes near Jamaica, where the oscillations were performed in 294 seconds, and, after traversing the north of Britain, it enters Norway to the south of Bergen. Advancing eastward, it passes between Stockholm and Torneo, and thence by St Petersburg and Moscow.

The observations of Professor Hansteen do not extend farther south than these lines, and therefore Captain Sabine has laid down in the map the lines in which *n* oscillations are performed in 308, 321, 335, 351, and 370 seconds, from his own observations and those of Humboldt. The lowest number of seconds in which *n* oscillations are performed is at the magnetic poles, where it is nearly 262 or 263, and the greatest, 370, the time in which they are performed at the equator.

We have stated that the isodynamical lines are nearly parallel to those of equal dip. This is the case in Scotland; but towards the east, in Norway and Sweden, the lines of equal intensity bend more to the north, and cut the former; and also, under the same line of equal dip, the intensity is weaker to the east than to the west. Hence M. Hansteen has found that the pole of the lines of equal dip lies in 71° of lat., and 102° of long., while the pole of intensity is in 56° of lat., and 80° of long. west of Paris. The first of these determinations coincides very nearly with the pole of Commander Ross, where the dip was 90°. The latest observations made during the arctic expeditions from England, and also those by Hansteen and Erman in Siberia, prove beyond a doubt the accuracy of the earlier conclusion of Hansteen, that the lines of equal intensity and equal dip are not parallel. Humboldt discovered the node of the magnetic equator with the isodynamical curve in 7° of S. lat., and 81° of long. west of Paris. He traced this last line to the west of the Cordilleras of the Andes, and along the coast of Peru, towards Kasma and Fluormay, even to the 10th degree of S. lat. M. Adolphus Erman found in Siberia, that the isodynamic line, where the intensity is 1·60 (that of the equator being 1·00), directs itself also from north to south with a slight inclination to the south-east. He observed this line *cut almost at right angles the curves of equal dip*, and then descend from the north-north-west to the south-south-east, from Ochotsk, near the mouths of the Oby, to Tomsk. M. Humboldt is of opinion that the isodynamical line and the Peruvian node of the magnetic equator have been carried, since his voyage, from east to west; and he informs us that M. A. Erman, in the 135th degree of long. west of Paris, and in the magnetic equator, found that the intensity of the magnetic forces was sensibly the same as he had found them twenty-six years before on the magnetic equator in Peru.

As the intensity of terrestrial magnetism at different places is not a function of the dip at these places, and the isodynamic lines are not parallel to those of equal dip, it is probable that different points of the equator have not the same magnetic intensity. "Having carried," says Humboldt, "the same needle or needles compared with them, from Paris to Mexico, to the magnetic equator in Peru, to Berlin, to Petersburg, to the shores of the Caspian, and to the north of Asia, I have expressed the magnetic intensities at these places, by taking for unity the intensity which I find on the magnetic equator in Peru, or rather in the intersection of this equator with the isodynamical line of minimum intensity. On this supposition, I find for Paris 1·3482, for Milan 1·3121, for Naples 1·2745. The very valuable observations of M. Rossel, at Surabaya in Java, and those of Captain Sabine near St Thomas, 5° north of the equator, indicate that the magnetic intensity is less on the magnetic equator near the west coast of Africa (long. 40. 24. W.), and in the great Italian archipelago, than in the portion of the magnetic equator which crosses Peru. Besides, M. A. Erman has observed, that on the east coasts of South America the intensities are much weaker at the same distances from the south terrestrial pole than on the west coasts. The intensity 1·00, found to the west of the new continent, on the magnetic equator in the South Sea, in 135° of west longitude, and 1° 55′ of south latitude, shows itself on the coasts of Brazil towards the 38th degree of south latitude, while the dip is there even more than 37° south. It appears to me more probable that the minimum intensity at the surface of the earth is to the maximum, not as 1 to 1·6 or 2, as has been supposed, but even much beyond the ratio of 1 to 2·6."

Observations are yet wanting to determine in what manner the intensity varies with the height. Humboldt is of opinion that it decreases, thus confirming the deductions of Kupffer.

By combining all the observations of intensity from 179° to 183°, M. Hansteen has drawn the conclusion, *that the total magnetic intensity is smaller in the southern than in the northern hemisphere.* M. Duperrey has confirmed this result. According to the investigations of Biot, the natural magnetic intensity, or I, is $= 2A.\sqrt{\frac{1}{4 - 3\sin^2\delta}}$, and that of the horizontal needle $= 2A\sqrt{\frac{1}{3 + \sec^2\delta}}$, δ being the dip; but these formulæ presuppose that the earth is perfectly homogeneous, and of course they cannot be verified by insulated observations. M. Duperrey has therefore been obliged, in order to bring all these observations into this state, to take the mean intensity of the terrestrial equator and of each of the parallels of the globe, and to multiply the circumference of each curve by its intensity in order to have the total intensity, and then to take the mean of the total intensities of the corresponding parallels in each hemisphere. In this manner he obtained all the points of the curve which represents the law of the increase of the magnetic forces from observation. The curve thus traced, when compared with that which is calculated by the formula of M. Biot, does not deviate from it above 0·015 of the intensity, supposing the intensity at the magnetic equator in Peru to be 1. He has found also that the surface of the north magnetic hemisphere is to that of the south one in the ratio of 1·0000 to 1·0152, a ratio which is the same as that of the total intensity of the south terrestrial hemisphere to the total intensity of the north terrestrial hemisphere; and he hence concludes, that *the surfaces of the two magnetic hemispheres are proportional to the intensities of the two terrestrial hemispheres.*

On the Monthly and Daily Change of Intensity.

Monthly and daily changes of intensity.

The magnetic intensity, like the other elements of terrestrial magnetism, suffers monthly and diurnal changes. By means of the vibrations of a needle delicately suspended, M. Hansteen found that the *minimum* of the daily change of intensity is between ten and eleven in the forenoon, and the *maximum* between four and seven in the afternoon in May, and about seven in June. The intensity is a maximum in December, and a minimum in June. The greatest monthly change in the intensity is a maximum in the months of December and June, about the time when the earth is in its perihelion and aphelion. It is a minimum near the equinoxes, or when the earth is at its mean distance from the sun. The greatest daily change is least in the winter and greatest in the summer, the greatest difference of the annual change of intensity is 0·0359. M. Hansteen has likewise found, that the magnetic intensity is diminishing in Europe, and that the decrease is greater in the northern and eastern, than in the southern and western parts, an effect which he conceives to be produced by the motion of the Siberian pole towards the east. At port Bowen, Captain Parry observed an augmentation of the magnetic intensity to take place from the morning till the afternoon, and a diminution of it from the afternoon till the morning. These results of Hansteen have been confirmed by Mr Christie,[1] who has shown that the terrestrial magnetic intensity is a minimum between ten and eleven o'clock in the morning, the time nearly when the sun is in the magnetic meridian; that it increases from this time until between nine and ten o'clock in the evening, after which it decreases, and continues decreasing during the morning, till it reaches its minimum between ten and eleven. These results were deduced from observations made in May, *within doors,* to determine the positions of the points of equilibrium at which a magnetic needle was retained at different hours during the day, by the joint action of two bar-magnets, and of terrestrial magnetism reduced to their true positions at the standard temperature (60°) of the magnets. As this change in the position of these points was produced by the change in the magnetic intensity, Mr Christie thus obtained accurate measures of the last of these elements by means of the formula

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[1] *Phil. Trans.* 1825, p. 49–51.

$$M - F\,(\cdot 004690814 + \cdot 000829329 \cos.^2 \varphi) = 0,$$

in which M is the horizontal part of the terrestrial magnetic force, acting on the north arm of the needle in the line of the dip, F the force with which a pole of the needle is repelled from a pole of the same name of either magnet, or attracted towards that of a contrary name at the unity of distance, and φ the angle which the axis of the needle makes with the meridian, or the azimuth of the point of equilibrium.

Mr Christie repeated his observations in *the open air* in June, and from these it appears that the minimum intensity happened nearly at the time the sun passed the magnetic meridian, and rather later than in May, which was also the case with the time of the sun's passage over the meridian. The intensity increased until about six o'clock in the afternoon, after which it appears to have decreased during the evening, and to have been decreasing from an early hour in the morning. Mr Christie has given the following interesting view of Hansteen's results and his own.

Intensity deduced from Hansteen's Observations in 1820.			Intensity deduced from Mr Christie's Observations in 1823.		
Time.	May.	June.	Time.	May.	June.
8 *h.* 0′ A. M.	1·00034	1·00010	7 *h.* 30′	1·00114	1·00061
10 30	1·00000	1·00000	10 30	1·00000	1·00000
4 0 P. M.	1·00299	1·00251	4 30	1·00175	1·00223
7 0	1·00294	1·00304	7 30	1·00220	1·00239
10 30	1.00191	1·00267	9 30	1·00231	1·00209

The principal difference between these results is, that in Mr Christie's observations the intensity seems to diminish more rapidly in the morning, and increase more slowly in the afternoon, than it does in those of Hansteen.

The following table shows the horizontal magnetic intensity at Göttingen, as determined by Professor Gauss, in different months of 1832, with great accuracy.

1832.	Horizontal Intensity.	1832.	Horizontal Intensity.
May 21.	1·7820	July 25, 26.	1·7845
„ 24.	1·7694	Sept. 9.	1·7764
June 4.	1·7713	„ 18.	1·7821
„ 24–28.	1·7625	„ 27.	1·7965
July 23, 24.	1·7826	Oct. 15.	1·7860

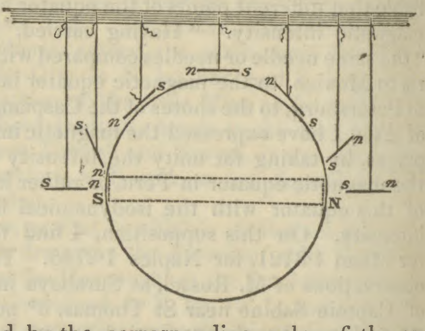
In order to obtain from these numbers the absolute magnetic intensity, to compare them with the results in Hansteen's table, they must be multiplied by the secant of 68° 22′ 22″, the dip at Göttingen on the 23d June 1832.

SECT. IV.—*On the Nature and Causes of the Earth's Magnetism.*

Nature and causes of the earth's magnetism.

The phenomena described in the preceding sections afford abundant evidence that the earth is in some way or other magnetic; but what is the nature of its magnetic condition, or from what cause it derives its origin, are points which it is not easy to determine. The earliest and the most natural supposition is that of Dr Gilbert, that the earth contains within itself a powerful magnet, lying in a position which nearly coincides with its axis of rotation. In this case, the pole of this magnet, which acts in our northern hemisphere, must have south polar magnetism, as it attracts the north pole of the needle; while the pole in the southern hemisphere must have north polar magnetism, as it attracts the south pole of the needle. That this hypothesis would, generally speaking, represent the ordinary phenomena of terrestrial magnetism, may be easily shown by placing a bar-magnet within a terrestrial globe, and observing the phenomena exhibited by a small needle suspended at its centre of gravity by a fine thread or fibre. As the magnet is placed out of the axis of rotation, the needle in the northern hemisphere will always point to the north end of the enclosed magnet, exhibiting all the phenomena of the variation of the needle, as usually observed. The general phenomena of the dip will also be exhibited, as shown in the annexed figure, where NS is the direction of the enclosed magnet, shown by dotted lines, S being the northern magnetic pole, and N the southern, and *ns*, *ns*, small needles suspended by fibres *f, f, f.* The needle has no dip at the equator, because each pole is equally attracted by the corresponding poles of the enclosed magnet, and at the poles S, N the dip is 90°, as observed at the northern magnetic pole by Commander Ross. At latitudes intermediate between the magnetic equator and the magnetic poles, the dip has an intermediate value.

Fig. 52.



In the same manner as a common bar-magnet communicates magnetism to a piece of soft iron held near it, the supposed magnet in the earth communicates magnetism to a soft iron bar held in the magnetic meridian, and parallel to the dipping-needle, which in this country is not far from a vertical position. The soft iron is temporarily a magnet, exactly like the soft bar in the presence of a real magnet, and possesses the very same properties.

In the progress of discovery, however, it has been found, that the phenomena of the dip and the variation are more complex than this hypothesis will allow us to suppose; and in measuring the magnetic intensity in Siberia, Hansteen has proved that there is another magnetic pole in that country, which regulates the magnetic phenomena. In order to account for these, we must therefore suppose another magnet passing through the globe in the direction

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of a diameter whose pole coincides with the Siberian magnetic pole. But even this addition to the hypothesis of Gilbert will not explain the phenomena, unless we resort to the absurd assumption of Halley, who gives rotatory movements to magnetic spheres placed in the interior of the globe.

A more sober and philosophical hypothesis is one which has been long gaining ground, and which recent discoveries have rendered still more probable. According to this hypothesis, the magnetism of the earth is not that of a magnet, but that of a sphere or spherical shell of iron on which magnetism is induced. The difference between these two magnetic states is very great. In regular magnets the centres of action are placed at their extremities or poles; but in masses of iron, either hollow or solid, either regular or irregular, the centres of action are always coincident with the centre of attraction of the surface of the mass. When the observations on the variation and dip of the needle became numerous and accurate, philosophers soon perceived that they could not be explained by the action of two magnetic poles at a distance from each other. M. Biot had the merit of first viewing the subject in this light, and he at length came to the conclusion, that the nearer the poles were taken to each other, the greater was the agreement between the computed and observed results; and by assuming the two centres as indefinitely near to each other in the centre of the earth, the coincidence between observation and calculation was as great as could be expected. Now it is a remarkable fact, that Mr Barlow discovered, as we have already seen, that such a coincidence in the centre of action actually takes place in all bodies which are magnetic by induction, such as iron spheres or shells; and he has applied this principle to account for the various phenomena of the dip and variation of the needle. Almost all the philosophers who have since investigated the subject have adopted this idea; and the only difficulty which attaches to it is, where to find the cause by which the earth's magnetism is induced. The following speculations on this curious subject are hazarded by M. Hansteen, in his work on the magnetism of the earth.

Hansteen.

"For these reasons, it appears most natural to seek their origin in the sun, the source of all living activity; and our conjecture gains probability from the preceding remarks on the daily oscillations of the needle. Upon this principle, the sun may be conceived as possessing one or more magnetic axes, which, by distributing the force, occasion a magnetic difference in the earth, in the moon, and all those planets whose internal structure admits of such a difference. Yet, allowing all this, the main difficulty seems not to be overcome, but merely removed from the eyes to a greater distance; for the question may still be asked with equal justice, *whence did the sun acquire its magnetic force?* And if from the sun we have recourse to a central sun, and from that again to a general magnetic direction throughout the universe, having the milky-way for its equator, we but lengthen an unrestricted chain, every link of which hangs on the preceding link, no one of them on a point of support. All things considered, the following mode of representing the subject appears to me most plausible. If a single globe were left to move alone freely in the immensity of space, the opposite forces existing in its material structure would soon arrive at an equilibrium conformable to their nature, if they were not so at first, and all activity would soon come to an end. But if we imagine another globe to be introduced, a mutual relation will arise between the two; and one of its results will be a reciprocal tendency to unite, which is designated, and sometimes thought to be explained, by the merely descriptive word attraction. Now, would this tendency be the only consequence of that relation? Is it not more likely that the fundamental forces, being driven from their state of indifference or rest, would exhibit their energy in all possible directions, giving rise to all kinds of contrary action? The electric force is excited, not by friction alone, but also by contact, and probably also, though in smaller degrees, by the mutual action of two bodies at a distance; for contact is nothing but the smallest possible distance, and that, moreover, only for a few small particles. Is it not conceivable that magnetic force may likewise originate in a similar manner? When the natural philosopher and the mathematician pay regard to no other effect of the reciprocal relation between two bodies at a distance, except the tendency to unite, they proceed logically, if their investigations require nothing more than a moving power; but should it be maintained that no other energy *can* be developed between two such bodies, the assertion will need proof, and the proof will be hard to find.

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"I reckon it possible, therefore, that, by means of the mutual relations subsisting between the sun and all the planets, as well as between the latter and their satellites, a magnetic action may be excited in every one of those globes whose material structure admits of it, in a direction depending on the position of the rotatory axes with regard to the plane of the orbit. Each of the planets might thus give rise to a particular magnetic axis in the sun; but as their orbits make only small angles with the sun's equator and each other, these magnetic axes would, perhaps, on the whole, correspond with the several rotatory axes. Such planets as have no moons would, on this principle, have but one magnetic axis; the rest would, in all cases, have one axis more than they have moons, if those different axes, by reason of the small angles which the orbits of their several moons form with each other, did not combine into a single axis. The conical motions by which the rotatory axes of the planets are carried round the pole of the ecliptic (the precession in the earth), joined to the revolving motion of the orbits about the sun's equator (which occasions the present diminution in the obliquity of the ecliptic), might perhaps, in this case, account for the change of position in the magnetic axis. It would greatly strengthen this hypothesis, if the above great magnetic period, after the lapse of which both axes again assume the same position, should in fact be found to coincide with the period of the precession, which, however, seems a little doubtful."

Such was the state of speculation on this part of the subject when Hansteen published his work on the magnetism of the earth. The poles of our globe were then regarded as the coldest parts on its surface; and no conjecture even had been hazarded regarding the connection between the phenomena of terrestrial temperature and terrestrial magnetism, till Sir David Brewster proved, from an immense number of meteorological observations, that there were in our northern hemisphere two poles of maximum cold; that these poles coincided with the magnetic poles; that the circle of maximum heat, like the magnetic equator, did not coincide with the equinoctial line; that the isothermal lines, and the lines of equal magnetic intensity, had the same general form surrounding and enclosing the magnetic poles and those of maximum cold; and that, by the same formula, *mutatis mutandis*, we could calculate the temperature and the magnetic intensity of any point of the globe. These views we have referred to more fully in the history of magnetism.

The monthly and daily changes in the intensity of terrestrial magnetism, and in the dip and variation of the needle, had led Canton and others to ascribe these changes to the action of the sun; and Captain Duperrey, in his paper on the magnetic equator, has ascertained, that the points of this great circle, or those where the magnetic intensity is a minimum, are also the warmest points of each meridian, Cause of the earth's magnetism.

or that the thermal and the magnetic equator are connected, as we had already proved to be the case with the thermal and magnetic poles. Captain Duperrey likewise attributes the differences in the magnetic intensities of different places to their difference of temperature; and he remarks, that in comparing the isothermal and the isodynamic lines, he has found a remarkable analogy in their curvatures, and particularly in the direction of their concavities and convexities. In support of these views, Captain Duperrey refers to the changes in the daily variation, as following the movements of the sun; and he infers that the southern hemisphere of our globe is a degree colder than the northern hemisphere.

But though it is now placed beyond a doubt, that the phenomena of temperature and magnetism are closely connected, and that the latter are powerfully influenced by the former, yet various questions arise, which it is very difficult to answer.

1. Have the phenomena of terrestrial magnetism an electric origin; that is, is the magnetism developed by electro-magnetic or thermo-magnetic causes? or,

2. Are the phenomena owing to the diffusion of iron or other magnetic metals through the solid mass of our globe, in which magnetism is induced by some exterior cause?

The electro-magnetic hypothesis, which was first stated by Sir David Brewster, has been ably supported by Professor Barlow, in a recent paper (*Phil. Trans.* 1831) *On the probable Electric Origin of all the Phenomena of Terrestrial Magnetism;* in which he considers it as probable, "that magnetism, as a distinct quality, has no existence in nature." As all the phenomena of terrestrial magnetism can be explained on the supposition that the magnetic power resides on its surface, it occurred to Mr Barlow, that if he could distribute over the surface of an artificial globe a series of galvanic currents, in such a way that their tangential power should everywhere give a corresponding direction to the needle, this globe would exhibit, while under electrical induction, all the magnetic phenomena of the earth upon a needle freely suspended above it. He accordingly put this idea to the test of experiment in the following manner:

Barlow's electro-magnetic globe.

"I procured," says he, "a wooden globe sixteen inches in diameter, which was made hollow for the purpose of reducing its weight; and, while still in the lathe, grooves were cut to represent an equator, and parallels of latitude at every 4½° each way from the equator to the poles; these grooves were about an eighth of an inch deep and broad; and lastly, a groove of the same breadth, but of double the depth, was cut like a meridian, from pole to pole, half round. These grooves were for the purpose of laying in the wire, which was effected thus: The middle of a copper wire, nearly ninety feet long, and one-tenth of an inch in diameter, was applied to the equatorial groove, so as to meet in the transverse meridian; it was then made to pass round this parallel, returned again along the meridian to the next parallel; then passed round this again; and so on, till the wire was thus led in continuation from pole to pole.

"The length of wire still remaining at each pole was bound with varnished silk to prevent contact, and then returned from each pole along the meridian groove to the equator. At this point, each wire being fastened down with small staples, the wires for the remaining five feet were bound together to near their common extremity, where they opened to form two points for connecting the poles of a powerful galvanic battery.

"When this connection was made, the wire became of course an electric conductor, and the whole surface of the globe was put into a state of transient magnetic induction; and consequently, agreeable to the laws of action above described, a neutralized needle freely suspended above such a globe would arrange itself in a plane passing from pole to pole through the centre, and take different angles of inclination, according to its situation between the equator and either pole.

"In order to render the experiment more strongly representative of the actual state of the earth, the globe, in the state above described, was covered by the gores of a common globe, which were laid on so as to bring the poles of this wire arrangement into the situation of the earth's magnetic poles, according to the best observations we have for this determination. I therefore placed them in latitude 72° north and 72° south, and on the meridian corresponding with longitude 76° west, by which means the magnetic and true equators cut one another in about 14° east, and 166° west longitude.

"The globe being thus completed, a delicate needle must be suspended above it, neutralized from the effect of the earth's magnetism, according to the principle I employed in my observations on the daily variation, and described in the Philosophical Transactions for 1823; by which means it will become entirely under the superficial galvanic arrangement just described. Conceive now the globe to be placed so as to bring London into the zenith, then the two ends of the conducting wire being connected with the poles of a powerful battery, it will be seen immediately that the needle, which was before indifferent to any direction, will have its north end depressed about 70°, as nearly as the eye can judge, which is the actual dip in London; it will also be directed towards the magnetic poles of the globe, thereby also showing a variation of about 24° to 25° to west, as is also the case in London. If now we turn the globe about on its support, so as to bring to the zenith places equally distant with England from the magnetic pole, we shall find the dip remains the same; but the variation will continually change, becoming first zero, and then gradually increasing to the eastward, as happens on the earth. If again we turn the globe so as to make the pole approach the zenith, the dip will increase, till at the pole itself the needle will become perfectly vertical. Making now this pole recede, the dip will decrease, till at the equator it vanishes, the needle becoming horizontal. Continuing the motion, and approaching the south pole, the south end of the needle will be found to dip, increasing continually from the equator to the pole, where it becomes again vertical, but reversed as regards its verticality at the north pole."

Although the artificial globe represents very exactly on a small scale all the phenomena of terrestrial megnetism, and although, as Mr Barlow says, "he has proved the existence of a force competent to produce all the phenomena, without the aid of any body usually called magnetic;" yet he acknowledges that, "we have no idea how such a system of currents can have existence on the earth, because, to produce them, we have been obliged to employ a particular arrangement of metals, acids, and conductors." The discovery of Dr Seebeck, however, that the mere application of heat to a circuit composed of two metals[1] is capable of developing the magnetic effects above described, is regarded by Professor Barlow as bringing us a step nearer to an explanation of the earth's magnetism, by referring us to nature as the great agent of all these phenomena, and he conceives that only one link is wanting to complete the explanation. This link, however,

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[1] Mr Sturgeon of Woolwich has produced similar effects by the application of heat to only one metal, viz. a rectangle of bismuth only.

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is a very important one, and we are just as much puzzled to discover the metallic thermo-magnetic apparatus, as we are to discover the electro-magnetic one. If it could be shown that the action of solar heat is capable of developing magnetism in particles such as those which are known to constitute our globe, the great difficulty would be removed; but until this is done, we are disposed to lean to the old though not yet exploded notion, that terrestrial magnetism is the effect of magnetic or ferruginous materials, which are disseminated through the mass of the earth. This leads us to consider the second question relative to the origin of terrestrial magnetism.

2. Are the phenomena owing to the diffusion of iron or other magnetic metals through the solid mass of our globe, on which magnetism is induced by some exterior cause?

In so far as our knowledge extends, iron and other magnetic metals are not so regularly diffused as to produce the magnetic phenomena; and we are not entitled to assume the existence of any regular metallic nucleus, or regular arrangement of metallic strata, capable of producing that uniform action in the magnetic needle which is indicated by the regularity of the isodynamical lines, or those of equal magnetic intensity. That there are actual magnets within the crust of our globe, and abundance of ferruginous matter capable of producing locally magnetic phenomena, cannot be doubted; but the action of these two classes of bodies is regulated by different laws, and we can only regard them as exercising a disturbing force in rendering irregular the action of some more general cause. If the ferruginous matter which produces magnetism is situated near the surface of the earth, we should expect a diminution in the intensity when the needle is made to oscillate above the deepest parts of the ocean, where the solid crust may be many miles distant. If it is, on the other hand, deeply seated, the intensity ought to diminish greatly as we ascend in balloons, or to the tops of our highest mountains; but none of these effects are observed, and it becomes therefore very improbable that the magnetic phenomena are produced either by ferruginous matter *near the surface, or far removed from it.*

Terrestrial magnetism supposed to reside in the atmosphere.

But though we cannot find the seat, or rather the intermedium, of terrestrial magnetism in the bowels of the earth, may we not, as a last resource, seek for it *in our atmosphere?* It appears to be demonstrated by the experiments of Fusinieri, of which we have given a full account in our article on ELECTRICITY, that metals, and *particularly iron,* exist in a state of vapour in our atmosphere; and hence we have a regular hollow shell of magnetic matter enveloping the earth, and capable, when magnetism is induced upon it by an exterior cause, of producing all the phenomena of terrestrial magnetism. In its undisturbed state of equilibrium, this magnetic atmosphere will act upon the needle, according to the laws which Mr Barlow found to regulate the action of an iron sphere or shell; but these laws will be modified by those which regulate the thermal state of the globe, and will be disturbed by sudden changes of temperature, and by the various electrical agencies which exercise so powerful an influence over the meteorological condition of the atmosphere. The more violent disturbances of electrical equilibrium will fuse, and throw down in the form of meteoric stones, the metallic vapour in their vicinity. Inferior electrical actions will render their progress visible in the form of lightning and fiery meteors, arising from the heated state of the metallic particles; while still feebler electricities will, by their accompanying heat, produce the sheets of summer lightning, and the more continued and shifting phenomena of the aurora. Hence the electric sounds and other accompaniments of the aurora; hence its connection with the magnetic pole and equator; and hence the disturbance of the needle, or the *magnetic hurricanes,* as Humboldt calls them, while the regular action of the metallic atmosphere is disturbed during the prevalence of the aurora, or of thunder storms. These views receive some support from the observations of MM. Gay-Lussac and Biot, from which it appears that the intensity of terrestrial magnetism is not diminished at the height of 13,000 feet above the earth; and Mr Henwood found the magnetic intensity as strong 710 feet above the level of the sea, as at the bottom of a mine 950 feet below the same level. Kupffer, on the authority, we believe, of a single observation, has given an opposite opinion; and Saussure conceived that the intensity was less on the Col de Geant than at Geneva, but the numbers which he gives actually authorizes the opposite conclusion.

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From a series of observations made in July 1830, by M. Quetelet, in Switzerland, it appears, that in place of the intensity diminishing with the height, it actually increases, the increase taking place gradually (with the exception of Bonneville) in ascending from Geneva to the Col de Balme, as is shown in the following table:

	Horizontal Intensity.
Geneva	1·0805
Bonneville	1·0765
Sallenches	1·0815
St Gervais	1·0861
Vaudagnes	1·0884
Servoz	1·0872
Mer de Glace	1·0885
Chamouni	1·0935
Col de Balme	1·0917
Martigny	1·0921
Hospice St Bernard	1·0966
Simplon village	1·0987
Domodossolo	1·0997

But an argument of still more weight may be derived from the admitted fact, that a *powerful source of magnetism actually exists in our atmosphere,* and that the south pole of the needle has a distinct connection with the source of this magnetism. This source of magnetism is the *aurora borealis,* and the south pole of the dipping needle points to the focus to which the beams of the aurora converge. These beams act as magnets, as we have seen in a previous section; the action of our magnetic atmosphere, when undisturbed by any other cause but that of temperature, tends to fix the needle in a specific direction, which varies within certain limits, depending on the ordinary changes of temperature; but when the regular magnetism of the atmosphere is disturbed by electric or other causes, the needle must necessarily be affected by the displacement or altered temperature of the magnetic matter, as exhibited in the motions and variations in the lustre of the beams of the aurora. The magnetic pole, therefore, in our hemisphere, will be a north pole attracting the south end of the needle, and creating an elevation of the south end in place of a dip of the north end.

By the aid of these views, all the magnetic phenomena of the aurora borealis, so ably described by Dr Dalton, and the disturbances of the needle, so accurately observed by M. Arago, in reference to auroræ that occurred in every part of the northern hemisphere, may be satisfactorily explained, as we have attempted to do in a preceding section.

In seeking for a cause which is capable of inducing magnetism on the ferruginous matter of our globe, whether we place it within the earth or in its atmosphere, we are limited to the SUN, to which all the magnetic phenomena have a distinct reference; but whether it acts by its heat or by its light, or by specific rays, or influences of a magnetic nature, must be left to future inquiry. Without placing any reliance on the observations which have been supposed to indicate a magnetic action in the violet rays, we attach some importance to the observations of Barlocci and Zantedeschi, who found that both natural and artificial magnets had their magnetism greatly increased by exposure to the common solar rays; a result which could not arise from their heating power, as an increase of temperature invariably diminishes the power of magnets.

Dalton's views respecting the aurora.

In the work of Dr Dalton, published in 1793, to which we have already referred, there are several ingenious hypothetical views respecting the cause of the aurora borealis and its magnetic influence, with which we were not acquainted till the sections on that subject were written; but as these views strongly confirm the hypothesis of terrestrial magnetism which we have ventured to bring forward, we shall state as briefly as we can the leading ideas of Dr Dalton.

1. *The region of the aurora* is 150 miles above the earth's surface. Immediately above the earth's surface is the region of the clouds, then the region of meteors called falling stars and fire-balls, and beyond this region is that of the aurora. In proof of the great height of the aurora (independent of actual measurement) Dr Dalton adduces its extremely attenuated light, which, he says, may spread over one half of the hemisphere, and not yield more light than the full moon. "This," he continues, "arises from the extreme rarefaction of the air, which is almost tantamount to a Toricellian vacuum; in fact, the light of the aurora exactly corresponds with that of the electric spark when sent through a tube in which the air has been rarefied to as high a degree as can be effected by a good air-pump."

2. *The matter of the aurora.*—"From the conclusions in the preceding section," says Dr Dalton, "we are under the necessity of considering the *beams* of the *aurora borealis* of a *ferruginous* nature, because nothing else is known to be magnetic; and consequently that there exists in the higher region of the atmosphere an electric fluid, partaking of the properties of *iron*, or rather of *magnetic steel;* and that this fluid, doubtless from its magnetic property, assumes the form of cylindric beams." "My *fluid of magnetic matter*," adds Dr Dalton in another place, "is, like magnetic steel, a substance possessed of the properties of magnetism." "Whether any of the various kinds of air or elastic vapour we are acquainted with is magnetic, I know not, but hope philosophers will avail themselves of these hints to make a trial of them."

3. *Exciting cause of the magnetism of the aurora.*—"With regard to the exciting cause of the aurora, I believe it will be found in change of temperature." "Nothing is known to affect the magnetism of steel; heat weakens or destroys it; electricity does more, it sometimes changes the pole of one denomination to that of another, or inverts the magnetism. Hence we are obliged to have recourse to one of these two agents, in accounting for the mutations above mentioned. As for heat, we should find it difficult, I believe, to assign a reason for such sudden and irregular productions of it in the higher regions of the atmosphere, without introducing electricity as an agent in these productions; but rather than make such a supposition, it would be more philosophical to suppose electricity to produce the effect on the magnetic matter *immediately*." "The beams of the *aurora* being magnetic, will have their magnetism weakened, destroyed, or inverted, *pro tempore*, by the several electric shocks they receive during an aurora."

4. *The nature of the magnetism of the beams of the aurora.*—Dr Dalton conceives the magnetism to be permanent, and not induced; and *each beam to be as it were a separate magnet*, with the regular polarity of permanent magnets. "I conceive that a beam may have its magnetism inverted, and exist so for a time, &c....and I farther conceive, that when the beam is restored to its natural position of the north pole downward, it is effected, not by inverting the beam wholly as a beam (for this is never observed in an aurora), but by inverting the constituent particles, which may easily be admitted, of a fluid."

"If a magnet be required to be made of a given quantity of steel, it is found by experience to answer best when the length is to the breadth as 10 to 1 nearly. It is a remarkable circumstance, that the length and breadth of the magnetic beams of the aurora should be so nearly in that ratio. Query, If a fluid mass of magnetic matter, whether elastic or inelastic, were swimming in another fluid of equal density, and acted on by another magnet at a distance, what form would the magnetic matter assume? Is it not probable it would be that of a cylinder, of proportional dimensions to the beams of the *aurora?*"

5. *Governing cause of the magnetism of the aurora.*—"As the beams," says Dr Dalton, "are swimming in a fluid of equal density with themselves, they are in the same predicament as a magnetic bar or needle swimming in a fluid of the same specific gravity with itself; but this last will only rest in *equilibrio* when in the direction of the *dipping needle*, owing to what is called the *earth's magnetism;* and as the former also rests in that position only, the effects being similar, we must, by the rules of philosophising, ascribe them to the same cause. Hence then it follows, that THE AURORA BOREALIS IS A MAGNETIC PHENOMENON, AND ITS BEAMS ARE GOVERNED BY THE EARTH'S MAGNETISM." "I am aware that an objection may be stated to this; if the beams be swimming in a fluid of equal density, it will be said they ought to be drawn down by the action of the earth's magnetism. Upon this I may observe, that it is not my business to show why this is not the case, because I propose the magnetism of the beams as a thing demonstrable, and not as a hypothesis. We are not to deny the cause of gravity because we cannot show how the effect is produced. May not the difficulty be lessened by supposing the beams of less density than the surrounding fluid?"

Although this brief abstract of Dr Dalton's essay contains many views which in their general bearing add to the probability of the hypothesis which we have maintained, yet we must state in a few words the difference between the two hypotheses.

1. According to our views, terrestrial magnetism resides wholly in the earth's atmosphere, which contains throughout its whole extent ferruginous and other metallic matter, and sulphureous exhalations, all of which are carried off by evaporation, by ejection from volcanoes, and by the returning strokes of electricity from the earth to the air. The actual existence of such materials in the atmosphere, particularly sulphureous and ferruginous matter, is proved by the observations of Fusinieri, and by the existence of meteoric stones and other solid substances which fall on the earth.

2. The magnetism which directs the needle is induced upon the magnetic matter in the atmosphere, like that of an iron sphere, by some exterior cause, although it is very probable that small local effects may be produced by ferruginous matter within the earth, and near its surface; but the only effect of these will be to produce small irregularities in the intensity of the magnetism of the needle, and in its direction.

3. As the colour of the electric spark, when taken from different bodies, or when passing through different media, depends on the solid matter which it renders luminous, so the different colours of lightning, of the auroral beams, of falling stars, and of meteors of every kind, are produced by the heat of the electric fluid either rendering the material substance visible by incandescence, or throwing it into a state of combustion.

4. The beams of the aurora are those portions of the

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magnetic atmosphere through which electricity is passing, and which, by being heated to different degrees, are brought to different states of incandescence, and have their induced magnetism increased, like that of all ferruginous bodies which are brought to a temperature less than that of white heat.

Although it is universally admitted that a source of magnetism has been proved to exist in our atmosphere, and though it is evident that the force which emanates from it is greater than any magnetic force which can be proved to have its origin in the solid part of the earth, yet it may be asked if there is any reason for believing that the magnetism in the atmosphere is strong enough to be considered as the only source of terrestrial magnetism. To this question, some of the facts already stated afford a pretty satisfactory answer. M. Arago has shown that the auroræ which exist only at St Petersburg, in Siberia, and even in North America, actually disturb the magnetic needle at Paris; and he considers it highly probable that the auroras even round the south pole of our globe extend their influence to Paris. If a force of such magnitude exists in insulated beams which form regular magnets, according to Dr Dalton, we need not scruple to suppose that a ferruginous atmosphere is capable of producing that degree of intensity which characterises terrestrial magnetism, and that the disturbances exhibited at Paris on the magnetic needle are the effect of local diminutions or augmentations of the magnetic force in Siberia, America, or even in the southern hemisphere.

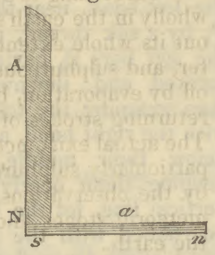
CHAP. X.—ACCOUNT OF THE DIFFERENT METHODS OF MAKING ARTIFICIAL MAGNETS.

Methods of making artificial magnets.

In the history of magnetism we have already made a brief reference to the principal methods of making artificial magnets. We shall now proceed to give a short account of the methods themselves.

In the infancy of the science, a bar B of hard steel was magnetised by rubbing it throughout its whole length on one of the poles N of a natural or artificial magnet A, in a direction at right angles to the line joining the two poles of the primitive magnet. By this process the new bar *a* will be rendered slightly magnetic, but its magnetism cannot possibly be completely developed unless in the two cases where the new bar is extremely small, or the primitive magnet A extremely powerful; and the magnetism which is communicated often exhibits different poles, or consequent points as they are called, throughout the length of the new bar.

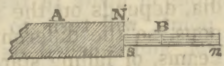
Fig. 53.



In using this method, the exciting pole should be slightly pressed upon the new bar; and after reaching the end of the bar at *s*, it must be lifted up and applied again to the other end, the friction being always made in the same direction.

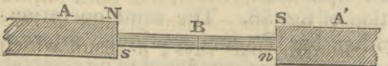
Another old method of making magnets consisted in placing the end *s* of a new bar B *in contact* merely with one of the poles N of a powerful magnet, and striking the new bar so as to make it ring during the time of its application. This method, however, like the first, will be effectual only for very small bars; the pole *s* will be the strongest, and the neutral point at B will be nearer *s* than *n*.

Fig. 54.



A more efficacious method of magnetising small bars by simple contact is shown in the annexed figure, by placing the new bar B between the opposite poles N, S of two strong magnetic bars A, A′, of nearly equal power. In this case the magnetism of B will be nearly twice as great as when only one, B or A, is used; and if there are no consecutive poles produced, the neutral point B will bisect *ns*.

Fig. 55.



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These simple methods were discontinued when the principles of magnetic induction were better understood, and several ingenious and highly effective processes of making artificial magnets were invented by the philosophers of the eighteenth century. The first of these was that of Mr Knight.

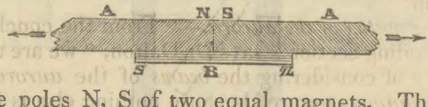
Sect. I.—*Account of Dr Gowin Knight's method of making Artificial Magnets.*

Knight's method.

Dr Gowin Knight, a physician in London, was long celebrated for the excellence of the artificial magnets which he made. The method which he used was kept a secret during his life, but was published after his death by Mr Wilson.

The bar or needle B, which he intended to magnetise, was tempered at a *cherry red heat*, and placed under the opposite poles N, S of two equal magnets. These magnets are then separated in opposite directions SA′, NA, so that the south pole S of the one passes over the *north polar* half B*n* of the bar B, and the north pole N of the other, over the *south polar* half B*s* of B. This operation is repeated several times, till the magnetism of the bar B is fully developed.

Fig. 56.



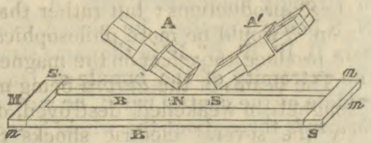
In this process the north pole N, while it attracts to the half B*n* all the south polar magnetism in B*s*, repels at the same time into B*s* all the north polar magnetism of B*n*. The same is true, *mutatis mutandis*, with the south pole S. When the bars A, A′ are large and powerful, it has been found that this process is capable of communicating to small bars all the magnetism of which they are susceptible.

Sect. II.—*Account of Duhamel's method of making Artificial Magnets.*

Duhamel's method.

After Dr Knight's process had been known and used, the artificial magnets which were made by it were in great request, and distributed throughout Europe. When the process, however, was applied to bars of great size, it was found to be defective; and M. Duhamel of the Academy of Sciences, in conjunction with M. Antheaume, set themselves to devise a better method, which is represented in the annexed figure. The bars B, B′ to be magnetised are placed parallel to each other, and have their extremities united by two pieces M, *m* of soft iron, at right angles to the bars. He then took two strong magnets A, A′, or two bundles of small bar-magnets, the bars of each bundle having their similar poles together; and having placed them, as in the figure, at an angle of about

Fig. 57.



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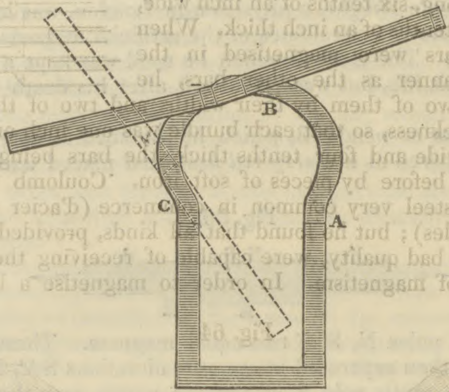
90°, or inclined 45° to the bar B, they were separated from each other as already described in the explanation of fig. 56. The same operation was repeated on the other bar B′, and continued alternately on both till the magnetism was supposed to be completely developed in both bars. When A and A′ are placed upon the second bar B′, the disposition of the poles must be reversed, the pole that was formerly to the right hand being now placed to the left. The two bars B, B′ are then turned, so that the undermost faces are uppermost, and the same process carried on as before.

The distinctive peculiarity of Duhamel's process consists in the employment of the pieces of iron M, *m*, and in the use of bundles of small bars, which are more efficacious than two single ones of the same size.

The very same method is applicable to curved bars, or those of the horse-shoe form, as shown in the annexed figure, where the inclined bars are carried round the curved bar A, B, C, exactly as they were along the straight bar B.

Fig. 58.

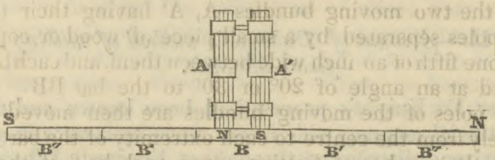


Sect. III.—*Account of Mr Michell's method of making Artificial Magnets.*

Michell's method of double touch.

About the same time that Duhamel was occupied with this subject, Mr Michell of Cambridge and Mr Canton were separately engaged in the same inquiry. Mr Michell published his method in 1750, to which he gave the name of the *method of double touch.* Having joined together, at the distance of a quarter of an inch, two bundles of strongly magnetised bars A, A′, their opposite poles N, S being together, he placed five or more equal steel bars B, B′, B′, B″, B″ in the same straight line; and resting the extremity of the bundle of magnets A, A′ upon the middle of the central bar B, he moved them *backwards* and *forwards* throughout the whole length of the line of bars, repeating the operation on each side of the bars, till the greatest possible effect was produced. By this method Mr Michell found that the middle steel bars B, B′, B′ acquired a very high degree of magnetic virtue, and greater than the outer bars B″, B″; but by placing these last bars in the middle of the series, and repeating the operation, they acquired the same degree of magnetism as the rest.

Fig. 59.



Mr Michell states, that two magnets will, by his process of double touch, communicate as strong a magnetic virtue to a steel bar, as a single magnet of five times the strength, when used in the process of single touch. The bars A, A′ act with the sum of their powers in developing magnetism in all parts of the line of bars between them, and with the difference of their powers in all parts of the line of bars beyond them. The external bars act the same part in this process as the two pieces of soft iron in the method of Duhamel.

Methods of making Artificial Magnets.

Sect. IV.—*Account of Canton's method of making Artificial Magnets.*

Canton's method.

In the year 1751 Mr Canton published his process, which he regarded as superior to preceding ones. He placed the bars as in Duhamel's method, joined by pieces of soft iron. He then applied Michell's method of double touch, and afterwards he separated the two bundles of magnets A, A′, and having inclined them to each other, as in Duhamel's method, he made them rub upon the bar from the middle to its extremities. The peculiarity of Canton's method is the union of these two processes; but Coulomb and others are of opinion that the latter part of the process is the only effectual one.

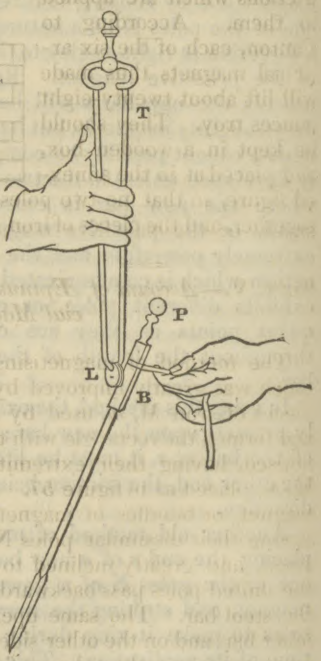
Without natural or artificial magnets.

In order to make artificial magnets without the aid either of natural loadstones or artificial magnets, Mr Canton gives the following detailed process.

He takes six bars of soft and six of hard steel, the former being smaller than the latter. The bars of *soft* steel should be three inches long, one fourth of an inch broad, and one twentieth thick; and two pieces of iron must be provided, each having half the length of one of the bars, and the same breadth and thickness. The bars of *hard* steel should be each five and a half inches long, half an inch broad, and three twentieths of an inch thick, with two pieces of iron of half the length, and the same breadth and thickness.

All the bars being marked with a line quite round them at one end, take an iron poker and tongs, or two bars of iron, the larger and the older the better, and fixing the poker P upright, as in fig. 60, hold to it with the left hand, near the top P, by a silk thread, one of the *soft* bars B, having its marked end downwards; then grasping the tongs T with the right hand, a little below their middle, and keeping them nearly in a vertical line, let the bar B be rubbed with the lower end L of the tongs, from the marked end of the bar to its upper end, about ten times on each side of it. By this means the bar B will receive as much magnetism as will enable it to lift a small key at the marked end; and this end of the bar being suspended by its middle, or made to rest on a point, will turn to the *north,* and is called its *north* pole, the unmarked end being the *south* pole.

Fig. 60.

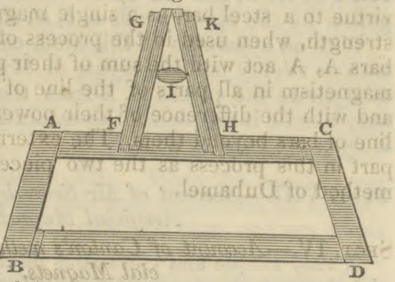


When four of the soft steel bars are thus rendered magnetic, the other two AC, BD must be laid parallel to each other, at the distance of about one fourth of an inch, as in

Methods of making Artificial Magnets.

the figure, having their dissimilar poles united with the smallest pieces of iron AB, CD. Two of the magnetised bars are then to be placed together as at G, with their similar poles united, and the other two as at K; and when separated by a piece of wood I, they are slid four or five times backwards and forwards along the whole length of the bar AC, so that the marked end F of G is nearest the unmarked end of AC, and *vice versa*. This operation is carefully repeated on BD, and on the other sides of both AC and BD. When this is done, the bars AC, BD are to be taken up and substituted for the two outer bars of the bundles G, K, these last being laid down in the place of the former, and magnetised in a similar manner. This operation must be repeated till each pair of the soft bars has been magnetised *three* or *four* times.

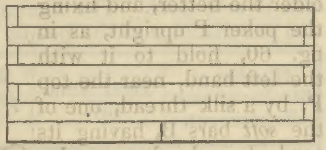
Fig. 61.



When the six soft bars are thus magnetised, they must be formed into two bundles of three each, with their similar poles together, and must be used to magnetise two of the *hard* bars in the manner already described; and when they are magnetised, other two of the hard bars must be touched in a similar manner. The soft bars are now to be laid aside, and the remaining two hard bars magnetised by the *four* hard bars already rendered magnetic; and when this is done the operation should be repeated by interchanging the hard bars, till they are impregnated with the greatest degree of permanent magnetism which this method is capable of communicating to them.

In performing the above operations, which may be completed in about half an hour, the bars AC, BD, and the pieces AB, CD should be placed in grooves, or fixed between pins of wood or brass, to keep them steady during the successive frictions which are applied to them. According to Canton, each of the six artificial magnets thus made will lift about twenty-eight ounces troy. They should be kept in a wooden box, and placed as in the annexed figure, so that no two poles of the same name may be together, and the pieces of iron AB, CD placed beside them.

Fig. 62.



SECT. V.—*Account of Æpinus's method of making Artificial Magnets.*

Æpinus's method.

The method of magnetising steel bars by the double touch was greatly improved by Æpinus. In place of the pieces of iron M, *m*, used by Duhamel, he used magnets, and formed the rectangle with the two steel bars to be magnetised, having their extremities united by two magnets M, *m*, placed as in figure 57. He then placed the original magnet, or bundles of magnets, A, A′, as in the figure, having their dissimilar poles N, S separated by a piece of wood, and greatly inclined to each other; and he made the united poles pass backwards along the whole length of the steel bar. The same operation was repeated on the other bar, and on the other side of each of them, care being taken to reverse the poles, as formerly mentioned, when the rubbing bars are removed from the one steel bar to the other. Æpinus found that a maximum effect was produced when the bars A, A′ were inclined 20° or 30° to the steel bar over which they passed.

SECT. VI.—*Account of Coulomb's method of making Artificial Magnets.*

Methods of making Artificial Magnets.

Coulomb's method.

The method of making artificial magnets employed by Coulomb consists of the most efficacious parts of the preceding processes, improved and extended by long experience in the art. The apparatus which he uses consists of *fixed* and *moving* bundles of magnets. Each of the fixed bundles consists of *ten* bars of steel tempered at a cherry-red heat, their length being about twenty-one inches, their breadth six tenths of an inch, and their thickness one fifth of an inch. Having rendered them as strongly magnetic as possible, with a natural or an artificial magnet, he joined them with their similar poles together, and formed them into two beds of four bars each, these beds being separated by small rectangular parallelopipeds *m*, *n* of soft iron, projecting a little beyond their extremities, as shown in the annexed figure. The *moving* bundles consist of four bars tempered at a cherry-red heat, each being about sixteen inches long, six tenths of an inch wide, and two tenths of an inch thick. When these bars were magnetised in the same manner as the other bars, he united two of them by their widths and two of them by their thickness, so that each bundle was one inch and two tenths wide and four tenths thick, the bars being separated as before by pieces of soft iron. Coulomb used a kind of steel very common in commerce (d'acier timbré à 7 etoiles); but he found that all kinds, provided it was not of a bad quality, were capable of receiving the same degree of magnetism. In order to magnetise a bar, he placed the large fixed bundles M, N in the same straight line, and at a distance a little less than the length of the bar to be magnetised; and this bar BB′ was placed as in the figure, so as to rest on the projecting pieces of iron, so that the contact took place only over a length of one fifth of an inch; the two moving bundles A, A′ having their dissimilar poles separated by a small piece of wood or copper, about one fifth of an inch wide between them, and each being inclined at an angle of 20° or 30° to the bar BB′. The united poles of the moving bundles are then moved successively from the centre to each extremity of the bar BB′, so that the number of frictions upon each half of the bar may be equal. When the last friction has been given, the united poles are brought to the middle point of the bar BB′, and then withdrawn perpendicularly. The same operation is then repeated on the other side of the bar BB′. If we wish to employ the method of Duhamel in place of that of Æpinus, we do not require the piece of wood or copper, but have only to separate the bars when their united poles are in the middle of the bar BB′, making each pole pass to the extremity of it.

Fig. 63.

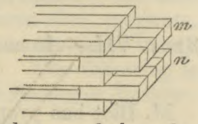
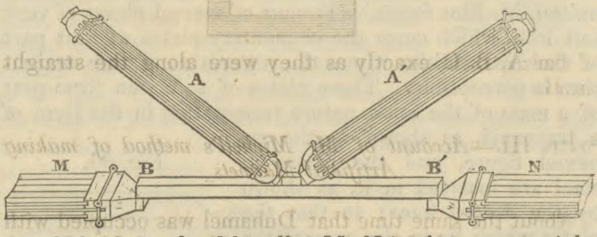


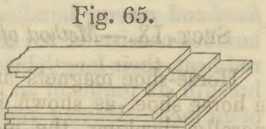
Fig. 64.



When the fixed and moving bundles are composed of bars which have not been magnetised to saturation, we must form new bundles with the newly magnetised bars, whose magnetism will be stronger than those by which they were magnetised, and by their heat magnetise anew the bars first used; and by repeating this process three or four times, the bars may be raised to the highest degree of magnetic virtue.

When the bars BB′ to be magnetised are very large, the moveable bundle should contain more than four bars, each of the bars retreating about half an inch in the direction of their thickness, as shown in the annexed figure. The advantage of this displacement arises from the fact, that the highest degree of magnetism resides in the extremity of the bar. Hence, by this arrangement, not only the most efficacious parts of the moving bar are brought into contact with the bar to be magnetised, and act more powerfully, but the bar nearest to the central one in the bundle tends not merely to maintain, but to augment, in its extremity, its degree of magnetism. The third bar produces the same good effect upon the second, and so on with the rest.

Fig. 65.

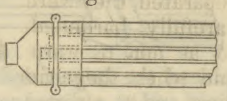


SECT. VII.—*Account of M. Biot's method of making Artificial Magnets.*

Biot's method.

M. Biot has proposed several important improvements on the process of Coulomb. As the bars are always bent a little in tempering, he recommends that they should at first be brought to as hard a temper as possible, and then annealed to the first shade of yellow. By this means they will have a sufficient degree of malleability to be again brought into shape, while they possess sufficient coercive power for receiving and retaining a high degree of magnetism. Regarding it as of essential importance to insure an intimate contact between the plates of the large bundles and the soft iron or armour by which they are united, M. Biot forms his armour of several plates of very soft iron, which cover the elementary plates at that part of their extremities where the repartition of free magnetism is perceptible. These plates of soft iron form part of a mass of the same nature terminating in the form of a trapezoid, as shown in the annexed figure, and the plates of steel are inserted in it, as shown by the dotted lines; so that the plates which lie in the axis of the bundles project a little beyond the lateral plates. The whole is then bound together with a collet of soft iron, held firmly by a screw. M. Biot remarks, that he has found from experience that this arrangement, indicated by theoretical considerations, is extremely advantageous.

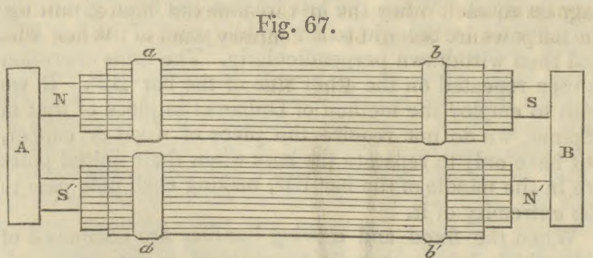
Fig. 66.



Coulomb's method of arming magnets.

Coulomb's method of fitting up, arming, and preserving his magnets, is shown in the annexed figure, representing two artificial magnets, armed at their extremities with two iron parallelopipeds, N, S, N′, S′; N, N′ being the north poles, and S, S′ the south poles. These parallelopipeds have their inner ends enveloped within the magnetic bars. The opposite poles N, S′, N′ S, are joined by pieces of soft iron A, B, and the bars of each magnet are held together by the upper bands a, b, a', b'.

Fig. 67.



With an apparatus of this kind, each part weighing fifteen or twenty pounds, eighty or 100 pounds is required to separate the pieces A, B from the poles, and an ordinary needle is magnetised to saturation by merely placing it upon the ends N S′ or N′ S.

SECT. VIII.—*Account of Mr Scoresby's method of making Artificial Magnets.*

Scoresby's method.

A very simple and efficacious method of making artificial magnets by percussion has been published by Mr Scoresby.[1] That iron became magnetic when struck by successive blows of a hammer in the direction of the dipping needle, was known to Dr Gilbert; but it is to Mr Scoresby that we owe a complete investigation of the subject. In order to determine the effects produced by percussion, Mr Scoresby used two methods, the one by observing the weight which the new magnet lifted, and the other by measuring the deviation which it produced on a magnetic needle. The following experiments were made with a cylindrical bar of soft steel six and a half inches long, one fourth of an inch in diameter, and weighing 592 grains. It was placed in a vertical position, resting on a piece of tin, and struck with a hammer of twelve ounces.

Number of Strokes at each Experiment.	Total Number.	Weight suspended by the Bar.	Deviation of the Needle; distance of Needle three Inches.
1	1	2	8°
1	2	0	10
5	7	4	12
10	17	6½	12½
5	22	6½	12½

When the steel bar was placed upon a stone, the effect was the same; but, as the following experiments show, a great increase of power was obtained by supporting the lower end of the bar upon the upper end of a large bar of iron or soft steel. The hammer weighed twelve ounces, and the distance of the needle was three inches.

Number of Strokes at each Experiment.	Total Number.	Weight suspended by the Bar.	Deviation of the Needle.
1	1	6½ grs.	13°
1	2	14	16
1	3	...	18
4	7	37	21
5	12	45	25
10	22	88	27
20	42	88	30
30	72	...	31
10	82	...	31½
By using a hammer weighing 22 ounces, an increased effect was produced.			
3	85	...	33
5	90	130	34
3	93	...	30
By reversing the poles, and again hammering with the twelve-ounce hammer.			
1	...	...	5
1	2	...	2

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[1] *Philosophical Transactions*, 1822, part ii. p. 241

Methods of making Artificial Magnets.

From these experiments it follows, that a cylindrical bar of soft steel weighing 592 grains, can be made to lift only six and a half grains, when struck in a vertical position, with its lower end resting upon tin or stone; whereas the same bar, when struck with twenty-two blows upon a rod of iron suspended at its lower end, which was a north pole, lifted eighty-eight grains; by using a larger hammer, its lifting power increased to 130. When the steel bar was reversed, so that its south pole was uppermost, its magnetism was almost destroyed by a single blow, and two blows were sufficient to change its poles. Mr Scoresby found, that when the steel magnet was struck in the plane of the magnetic equator, its polarity also disappeared; but several blows were necessary to effect this change.

In another set of experiments on the effect of percussion on magnets, he employed a flat bar-magnet seven and seven tenths inches long, half an inch wide, one-seventh thick, and weighing 1170 grains.

When suspended vertically, with its south end uppermost, it produced, at the distance of eight inches, a deviation of 45° on the needle; but after 60, 80, and 100 blows, the deviation was reduced to 25°.

When the north pole was placed uppermost, other thirty blows reduced the deviation still farther, from 25° to 14°.

When the bar was again magnetised, and hammered upon a piece of tin, it produced a deviation of 50°; but after twenty blows, with the south pole uppermost, the deviation became 33°. By other sixty blows, with the north pole uppermost, the deviation became 24°.

From the results obtained in the preceding experiments, Mr Scoresby deduced the following method of making artificial magnets by percussion.

"I procured two bars of soft steel thirty inches long and an inch broad, also six other flat bars of soft steel eight inches long and half an inch broad, and a large bar of soft iron. The large steel and iron bars were not, however, absolutely necessary, as common pokers answer the purpose very well; but I was desirous to accelerate the process by the use of substances capable of aiding the development of the magnetical properties in steel. The large iron bar was first hammered in a vertical position; it was then laid on the ground with its acquired south pole towards the south, and upon this end of it the large steel bars were rested while they were hammered; they were also hammered upon each other. On the summit of one of the large steel bars, each of the small bars, held also vertically, was hammered in succession; and in a few minutes they had all acquired considerable lifting powers. Two of the smaller bars, connected by two short pieces of soft iron in the form of a parallelogram, were now rubbed with the other four bars, in the manner of Canton. These were then changed for two others, and these again for the last two. After treating each pair of bars in this way for a number of times, and changing them whenever the manipulations had been continued for about a minute, the whole of the bars were at length found to be magnetised to saturation, each pair readily lifting above eight ounces.

"In accomplishing this object, I took particular care that no magnetic substance was used in the process. All the bars were freed of magnetism before the experiment, so that none of them, not even the largest, produced a deviation of five degrees on the compass at three inches distance. Any bars which had been strongly magnetised, and had had their magnetism destroyed or neutralized (either by hammering, heating, or by the simultaneous contact of the two poles of another magnet placed transversely), I always found had a much greater facility for receiving polarity in the same direction as before, than the contrary. Hence it generally happened that one blow with the original north end downwards, produced as much effect as two or three blows did with the original south end downwards."

Methods of making Artificial Magnets.

By this ingenious process, any person who has no magnets within his reach, may communicate the strongest degree of permanent magnetism to hard steel bars of any magnitude, the bars magnetised by percussion being employed, as in the process of Coulomb, to magnetise the large bars which are required.

SECT. IX.—*Method of making Horse-Shoe Magnets.*

Method of making horse-shoe magnets.

Horse-shoe magnets are those which have the form of a horse shoe, as shown in fig. 58; and this form is, generally speaking, the most convenient for use, and for the preservation of their magnetic power. In all experiments where a large weight is to be lifted, the horse-shoe magnet is indispensable; and in consequence of the two poles being brought together, they may be substituted with great advantage for magnetising steel bars by the method of double touch.

In order to form a powerful magnetic battery, the best way is to unite a number of similar horse-shoe magnets, with their similar poles together, and to fix them firmly together in a case of copper or leather. The following is the method recommended and used by Professor Barlow: He took bars of steel twelve inches long, and having bent them into the horse-shoe shape, their length was six inches, their breadth one inch at the curved part, and three fourths of an inch at their extremities, and their thickness one fourth of an inch. They were filed very nicely, so as to correspond, and lie flatly upon each other. They were then drilled with three holes in each, as seen in the figure, and by means of screws V, V passing through these holes, *nine* horse-shoe bars were bound together. When the heads and ends of the screws were constructed, so as to leave the outer surfaces smooth, the mass of bars was filed as if they were one piece, and the surface made flat and smooth. When the bars were separated, they were carefully hardened, so as not to warp, and when they had been well cleaned and rendered bright, but not polished, they were magnetised separately in the following manner: When the two extremities of the bar are connected by a piece of soft iron M, the magnetism may be developed in the two halves by Duhamel's method, as in the annexed figure; or, following Æpinus, we may apply a strong magnet to each pole, and connect their extremities either with a piece of soft iron or another magnet, or we may apply two horse-shoe magnets to each other, as in the annexed figure, uniting the poles which are to be of contrary names. When the magnet or magnets are prepared in any of these ways, they are then to be magnetised with another horse-shoe magnet

Fig. 68.

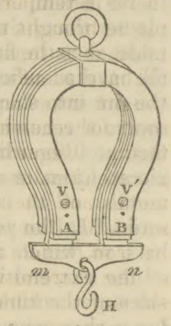


Fig. 69.

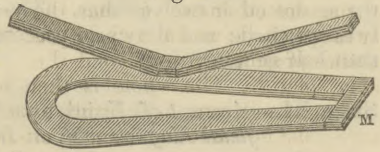
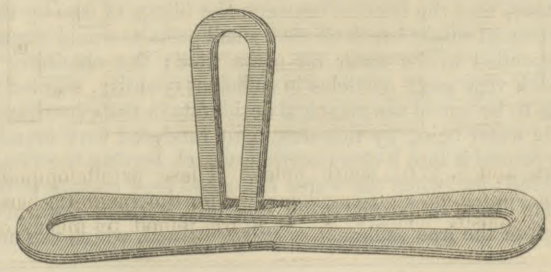


Fig. 70.



AB, by placing its north pole next to what is to be the south pole of one of the horse-shoe bars, and then carrying the moveable magnet round and round, but always in the same direction. In this way a very high degree of magnetic virtue may be communicated to each of the *nine* bars. When this is done, they are to be reunited by the three screws, and their poles or extremities connected by a piece of soft iron, or *lifter*, as in fig. 68, having at its middle a hook H for suspending any weight. As the lifting power depends on the accurate contact of the poles of the magnets with the lifter, the extremities should, after hardening, be properly rubbed down with putty upon a flat surface.

A magnet of this size and form was found by Professor Barlow to suspend *forty pounds;* but he afterwards found that a greater proportional power could be obtained by using bars that were long in comparison with their breadth.

Sect. X.—*Account of Professor Barlow's method of magnetising a number of Rectilineal Bars with a Horse-Shoe Magnet.*

Barlow's method of magnetising bars.

The following method of making artificial magnets is both a simple and efficacious one, and has been practised successfully by Professor Barlow. Having occasion for thirty-six magnets, twelve inches long, one and a fourth broad, and seven sixteenths of an inch thick, he placed thirty-six bars of steel, of these dimensions, on a table, so as to form a square, having nine bars on each side, the marked or north pole of each bar being in contact with the unmarked or south pole. At the angular points of the square the inner edges of the bars were brought into contact, and the external opening thus left was filled up by a piece of iron one inch and a quarter square and seven sixteenths of an inch thick. The horse-shoe magnet described in the preceding section was set upon one of the bars, so that its north pole was towards the unmarked end of the bar, and was then carried or rubbed along the four sides of the bars; and the operation was continued till the horse-shoe magnet had gone twelve times round the square. Without removing the magnet, each bar was turned one by one, so as to turn their lower sides uppermost, and the horse-shoe magnet was made to rub along the four sides of the square other twelve times. The bars were then highly magnetised; and the whole process did not occupy more than half an hour.

Sect. XI.—*Account of Knight's method of forming Artificial Magnets with an Iron Paste.*

Knight's artificial magnets of paste.

Although the following method of making a magnetic paste has been given in almost every treatise on magnetism, and was kept a secret by its inventor, yet we have no distinct information that it has been found superior in any respect to steel as a vehicle of magnetism. Mr Benjamin Wilson communicated the method to the Royal Society after the death of Mr Knight.

"Having provided himself with a large quantity of clean filings of iron, Dr Knight put them into a tub that was more than one third full of clean water; he then, with great labour, worked the filings to and fro for many hours together, that the friction between the filings of iron by this treatment might break off such small parts as would remain suspended in the water for some time; the obtaining of which very small particles in sufficient quantity, seemed to him to be one of the principal desiderata in the experiment. The water being by this treatment rendered very muddy, he poured it into a clean earthen vessel, leaving the filings behind; and when the water had stood long enough to become clean, he poured it out carefully, without disturbing such of the iron sediment as still remained, which was now reduced to an almost impalpable powder. This powder was afterwards removed into another vessel, in order to dry it; but as he had not obtained a proper quantity of it by this first step, he was obliged to repeat the process many times. Having at last procured enough of this very fine powder, the next thing to be done was to make a paste of it, and that with some vehicle which could contain a considerable quantity of the phlogistic principle. For this purpose he had recourse to linseed oil in preference to all other fluids. With these two ingredients only he made a stiff paste, taking particular care to knead it well before he moulded it into convenient shapes. Sometimes, while the paste continued in its soft state, he would put the impression of a seal on several pieces, one of which is in the British Museum. This paste was then put upon wood, and sometimes on tiles, in order to bake or dry it before a moderate fire, at about a foot distance. The doctor found that a moderate fire was most proper, because a greater degree of heat made the composition frequently crack in many places.

"The time necessary for baking this paste was generally five or six hours before it attained a sufficient degree of hardness. When that was done, and the several baked pieces were become cold, he gave them their magnetic virtue in any direction he pleased, by placing them between the extreme ends of his magazine of artificial magnets, for a few seconds or more, as he saw occasion. By this method the virtue they acquired was such, that when any one of these pieces was held between any of his best ten-guinea bars, with its poles purposely inverted, it immediately of itself turned about to recover its natural direction, which the force of these very powerful bars was not sufficient to counteract."[1] After giving the preceding method, M. Biot remarks that it consists in procuring a very fine powder of iron a little oxidated, all the particles of which he united by means of linseed oil, or any other substance fitted to give them a proper degree of oxygenation. "When this paste was magnetised," he continues, "each particle of the powder became a small magnet, in which the development of the magnetism might be very powerful, on account of the suitable degree of coercive power produced by the oxygenation; and the homogeneity of this state in all the particles, as well as their extreme tenuity, might give to the whole system the most favourable arrangements for receiving a high degree of magnetism." M. Biot conceives that a somewhat analogous effect might be obtained by steel of an equal and homogeneous grain, the carbon giving a coercive power like oxygen; but he thinks that the paste is likely to form better magnets. He is of opinion also that some powerful natural magnets may owe their virtue to the union of similar qualities.

Dr Fothergill, who had seen Mr Knight's paste magnets in his own possession, says that the mass had the appearance of a piece of black lead, though less shining. He informs us also of a very remarkable fact, if it be true, that while the poles of a natural loadstone, or of the hardest steel magnet, could be changed, those of the paste magnets were immoveable. A small piece, of about half an inch square and one fourth thick, was powerfully magnetic though unarmed; and its poles could not be altered though it was placed between two of Mr Knight's largest and most strongly impregnated magnetic bars.[2]

Conceiving that the powder which formed the basis of this paste was the *black oxide of iron*, or *martial Ethiops,* M. Cavallo has given the following receipt for imitating natural magnets; but he does not say that the magnets made by it are better than those of steel. "Take some martial Ethiops reduced into a very fine powder, or, which is more easily procured, *black oxide of iron*, the scales which fall from red-hot iron when hammered, and are

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[1] *Phil. Trans.* 1779, vol. lxix. p. 51.

[2] *Ibid.* vol. lxvi.

Methods making rtificial Magnets.

found abundantly in smiths' shops. Mix this powder with drying linseed oil, so as to form it into a very stiff paste, and shape it in a mould so as to give it any form you require, whether of a terella, a human head, or any other. This done, put it into a warm place for some weeks, and it will dry so as to become very hard; then render it magnetic by the application of powerful magnets, and it will acquire a *considerable* power."

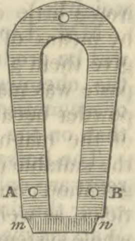
SECT. XII.—*Account of the method of arming and preserving Natural and Artificial Magnets.*

n arming d pr rving agnets.

We have already stated, that when a piece of soft iron is suspended at the pole of a magnet, this piece of iron is rendered magnetic, and that a second and a third smaller piece of iron suspended from the other piece of iron also become magnetic, the magnet developing magnetism in the first piece of iron, the first piece developing it in the second, and so on. Each piece of iron re-acts as a magnet on the larger piece on which it hangs, improving or increasing the development of its magnetism. Hence the lifting power of a magnet may be increased by suspending to one of its poles, day after day, a small additional piece of iron.

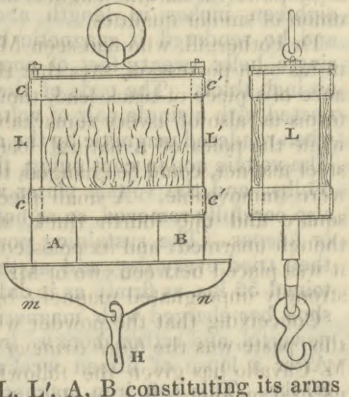
On this property is founded the method of arming natural and artificial magnets, for the purpose both of increasing and preserving their magnetic power. In order to support the greatest weight with any magnet, both its poles should be brought in action. In the horse-shoe magnet this is easily done, so that the *armature* for it is made by merely placing a piece of soft iron *mn* upon its poles A (north) B (south), having a hook attached to it for hanging on weights, as in fig. 68. That the power of this magnet is not only increased but preserved, is easily proved; but the following striking experiment of Mr Watkins affords the most beautiful illustration of the principle. He magnetised a horse-shoe bar *of soft iron*, made of a bar nineteen inches long and one inch square, when its poles A, B were joined by another piece of iron *mn*, and he found that it preserved its magnetic virtue for a long time,[1] while its poles were thus united. The moment, however, that the armature *mn* was removed, the magnetism of the horse-shoe bar almost wholly disappeared.[2]

Fig. 71.



The best armature for a natural magnet is shown in the annexed figure, where L, L′ are two broad pieces of soft iron applied to the poles, and projecting on one side of it. To these projecting ends or transferred poles A, B a piece of iron *mn* is applied, so as to touch them both, as in the horse-shoe magnet in fig. 68. The lateral pieces of iron L, L′ are commonly held firm to the magnet by means of a box of brass, silver, or copper *cc′c′*, and the magnet is then said to be armed, the pieces of iron L, L′, A, B constituting its arms or armature.

Fig. 72.



A loadstone armed in the preceding manner may be strengthened by Professor Barlow's method of magnetising horse-shoe magnets; and if we suspend a scale or bag from the hook H, and add, day after day, some additional weight, it may be made to suspend *two* or *three* times the weight that it could lift if applied to it at once. If its force, however, is overpowered by too great a load, its strength will revert to what it was at first; but if we take out of the scale a certain part of the load which it can suspend, we may again proceed to add more weight gradually, till it carries its maximum load.

Methods of making Artificial Magnets.

In order to preserve loadstones and magnets, their armature should always be applied to them. They should be kept in a cool place, free from vibrations, and rough treatment of every kind. Bar-magnets should always be kept with their dissimilar poles together; and both single magnets and needles will have their power not only preserved, but increased, by keeping them surrounded with a mass of dry filings of soft iron, each particle of which will re-act, by its induced magnetism, upon the point of the magnet to which it adheres, and maintain in that point its primitive magnetic state.

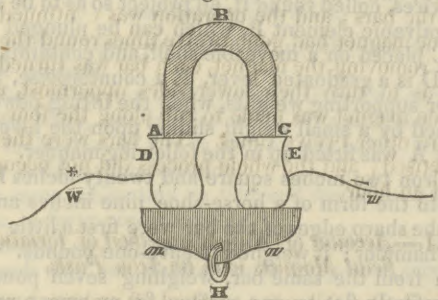
SECT. XIII.—*Account of the method of making Temporary Bar-Magnets of Soft Iron under the influence of Electric Currents.*

Electro-magnets.

In our history of ELECTRICITY we have given some account of the discoveries of M. Arago, Sir H. Davy, M. Savary, and others, relative to the communication of magnetism to steel by ordinary electricity. The subject will be resumed under the article VOLTAIC ELECTRICITY; but, without anticipating what properly belongs to that science, we shall give an account in this section of the method of making bar-magnets of soft iron by the influence of electric currents.

This process consists in winding spirally round a horse-shoe bar of iron ABC, a copper wire covered with silk thread. A galvanic current is then made to pass through the bar ABC by two wires W, *w*, communicating with two wooden vessels D, E containing mercury. When the voltaic apparatus consists of a single element, viz. one plate of zinc placed in a copper vessel, and having an area of five square feet, the magnet, when armed, as shown at *mn*, may suspend by the hook H 100 kilogrammes.

Fig. 73.



M. Moll[3] took a horse-shoe bar 0·22 of a metre high, and 0·025 thick, and rolled round it eighty-three times a copper wire covered with silk, and 0·003 of a metre in diameter. To each of the branches was adapted a counterweight of a pound weight, and projecting a little on both sides. The two extremities of the wire were made to communicate, by small vessels of wood filled with mercury, with two elements of a voltaic battery, composed of a bucket of copper, in which was plunged a plate of zinc, whose surface, in contact with the fluid, was eleven square feet. The moment the communication was made, the magnet supported twenty-five kilogrammes, and with some precautions thirty-eight. Another horse-shoe bar, weighing thirteen kilogrammes, 0·93 of a metre high, and fifty-five millimetres thick, lifted seventy-seven kilogrammes. When the direction of the current is changed, the poles of the magnet are instantly reversed; and when the current is stopped, the magnetism of the bar diminishes, though M. Moll found it capable of carrying twenty-five kilogrammes a quarter of an hour after the current ceased. M. Moll found that the magnetic intensity of the bar was not increased by increasing the number of the voltaic elements or plates; that a horse shoe of copper was not magnetised; and that a horse-shoe magnet was not rendered more magnetic by the electric current.

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[1] See the following section.

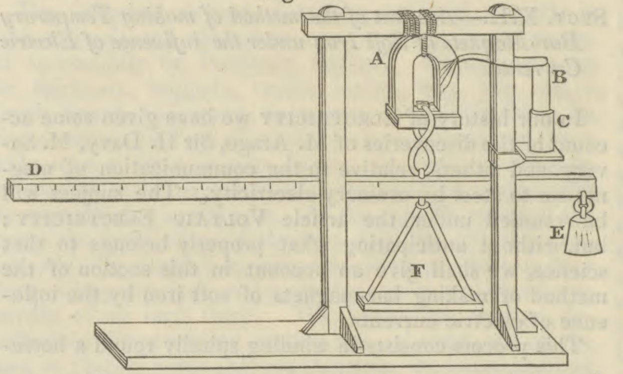
[2] *Phil. Trans.* 1833, p. 338.

[3] *Ann. de Chim.* vol. l. p. 326.

Professor Henry.

Professor Henry of Albany Academy had obtained analogous results about the same time with Professor Moll. The apparatus which he used is shown in the annexed figure, which represents a strong rectangular wooden frame three feet nine inches high, and twenty inches wide. The magnet A is covered with linen, and the ends of the wires, coiled round it, all project so as to be soldered to the galvanic element B, which can be plunged into the vessel C placed on a moveable shelf, and containing dilute acid. D is a graduated lever, E a counterpoise, and F a scale for supporting weights, when the lifting power is not estimated by a small weight sliding upon the lever. The magnet A was fitted up in the following manner. "A bar of soft iron two inches square and twenty inches long was bent into the form of a horse-shoe nine inches and a half high; the sharp edges of the bar were first a little rounded with a hammer; it weighed twenty-one pounds. A piece of iron from the same bar, weighing seven pounds, was filed perfectly flat on one surface, for an armature or lifter; the extremities of the legs of the horse-shoe were also truly ground to the surface of the armature. Around this horse-shoe 540 feet of copper bell-wire were wound, in nine coils of sixty feet each. These coils were not continued around the whole length of the bar, but each strand of wire, according to the principle before mentioned, occupied about two inches, and was coiled several times backward and forward over itself; the several ends of the wires were left projecting, and all numbered, so that the first and the last end of each strand might be readily distinguished. In this manner was formed an experimental magnet on a large scale, with which several combinations of wire could be made by merely uniting the different projecting ends. Thus, if the second end of the first wire be soldered to the first end of the second wire, and so on through all the series, the whole will form a continued coil of one long wire. By soldering different ends, the whole may be formed into a double coil of half the length, or into a triple coil of one third the length," &c.[1]

Fig 74.



In making experiments with this magnet, a small single battery was used, consisting of two concentric copper cylinders, with zinc between them; the whole of the zinc surface in action, including both sides of the zinc, was two fifths of a square foot, and the quantity of dilute acid only half a pint. The following were the results:

Number of Wires soldered to the Battery in succession.	Weight lifted, in Pounds avoirdupois.
1. Each soldered to the battery in succession	7
2. One on each side of the arch	145
2. One from each end of legs	200
3. One from each end of legs, and the other from middle of arch	300
4. Two from each end	507
6. Wires attached	570
9. All the wires attached	650
9. A plate of zinc twelve inches long and six wide, and surrounded with copper, substituted for the preceding battery	750

When a pair of plates, exactly *one inch square*, was attached to the wires, the weight lifted was eighty-five pounds.

Professor Henry mentions that this magnet weighed twenty-one pounds, and lifted more than thirty-five times its own weight, whereas the largest natural magnet known, and in the possession of Mr Peale of Philadelphia, lifts three hundred and ten pounds, or about six times its own weight.

MM. Lipkens and Quetelet.

MM. Lipkens and Quetelet found that great effects will be produced by small voltaic surfaces, provided that the chemical action is energetic, and that the degree of magnetism depends more on the size of the iron shoe, than on the dimensions of the voltaic plates.[2]

Mr Watkins.

The horse-shoe iron magnets formed by electrical currents are only temporary, and it became interesting to discover the time of duration of the magnetism. Mr Francis Watkins made some interesting experiments on this subject.[3] He found that when the *armature* or *keeper* is *removed* from the two poles of the magnet, it instantly loses all its magnetism when the electric current is cut off; but that if the *armature* is kept upon the poles, the soft iron magnet will retain its magnetism for a great length of time. Mr Watkins made a horse-shoe bar with a piece of soft iron eighteen inches in length and one inch in diameter, and he rendered it magnetic by winding round it in a single helix twenty feet of copper wire one fifteenth of an inch thick. The ends of the copper helix being connected with a single pair of voltaic plates, the horse-shoe, when rendered magnetic by the current, supported 125 lbs. The voltaic action continuing, the weight was reduced to 56 lbs., and the voltaic plates removed; the weight was also carefully removed, so as not to displace the armature or keeper. The sustaining power of the horse-shoe was then tried every day, and at the end of ten days it sustained 56 lbs. as firmly as it did at first. Another horse-shoe bar charged with magnetism in November, was as powerful, and rather more so, in April, than it was at first. After a lapse of fifteen weeks it frequently supported 30 lbs. This soft iron magnet was tried at the Duke of Sussex's house on the 27th of April, *and, though nearly*

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[1] Professor Silliman's *Journal*, 1831, vol. xix. p. 404.

[2] *Ann. de Chim.* vol. l. p. 328-331; and Quetelet's *Corresp. Astronom. de Bruxelles.*

[3] *Phil. Trans.* 1833, part ii. p. 333-343.

Methods of making Artificial Magnets.

six months had elapsed since it received the magnetic virtue, it supported 100 lbs.; but the instant that the *keeper* was separated from its poles, almost all the magnetism disappeared. When the keeper was again applied, there was not enough of magnetism even to support the keeper.

Mr Watkins made some interesting experiments on the lifting powers of soft iron magnets when plates of mica of different thickness were interposed between the poles and the keeper. The magnet was of the size and shape already stated, but Mr Watkins has not mentioned the successive thicknesses of the mica plates, nor does he state that they were of equal thickness. Had he mentioned the tints which each of them polarized, it would have been easy to compute their exact thicknesses. The following were his results:—

Number of Plates of Mica interposed.	Number of Pounds supported besides the Keeper.
1	49
2	40
3	26
4	17
5	13
6	8
7	4½
8	2½
9	2
10	1½
11	1
12	0¾
13	0½
14	The keeper only.
15	0

When a piece of common *writing paper* was placed between the poles and the keeper, 28 lbs. were supported by the magnet.

SECT. XIV.—*Account of M. Aimé's method of making Permanent Artificial Magnets.*

Aimé's Method.

This method, which has been recently published by M. Aimé,[1] is one equally simple and efficacious. It is founded on the facts described in the preceding section, and consists in holding a bar of red-hot steel with pincers between the two poles N, S of a horse-shoe magnet rendered magnetic by an electrical current. The horse-shoe and the included bar, which should exactly fit the space between the poles, are then plunged in cold water, and kept there for a little time, depending on the size of the real magnet, till the bar is thoroughly cold along its axis. In order to prevent the brass spiral wire that is curled round the horse-shoe bar from being wetted when the apparatus is under water, the extremities of the wire are enveloped in a piece of linen covered with mastic. The ends of the conducting wire should be soldered to the zinc and copper ends of the battery. M. Aimé employed a single wire for the spiral round the horse-shoe; but he observes that several may be united in a bundle, or a copper riband may be used covered with silk or varnish. In all the different trials that M. Aimé has made of this method, he has obtained satisfactory results.

SECT. XV.—*Account of the Experiments made by Coulomb and Kater, on the efficacy of the different methods of making Artificial Magnets.*

Coulomb's comparison of different methods.

Coulomb was the first person who examined experimentally the value of the different methods of making artificial magnets. The following is a brief abstract of his results.

Methods of making Artificial Magnets.

1. *Wires of tempered steel, twelve inches long and one twentieth of an inch in diameter.*

When rubbed at right angles on the pole of a single artificial magnet, it performed ten oscillations in seventy-four seconds.

When rubbed at right angles upon the poles of four united bar-magnets, or magnetised by the methods of Duhamel and Æpinus, it performed the same number of oscillations in the same time. Hence *small* steel wires attain their maximum degree of magnetism equally well by all the different methods.

2. *A plate of annealed steel twelve inches long, one third wide, and one forty-second of an inch thick.*

When rubbed at right angles on a single pole, it performed ten oscillations in seventy-seven seconds.

When rubbed on *two* united poles, ten oscillations in seventy-five seconds.

When rubbed on *ten* poles, ten oscillations in seventy-five seconds.

By the methods of Duhamel and Æpinus, ten oscillations in seventy-five seconds.

The effect of the different methods is now perceptible, the first being the worst.

3. *A plate of steel six and a half inches long, nine twenty-fifths wide, and one forty-second thick.*

When rubbed on two poles, ten oscillations in fifty-one seconds.

Upon five poles, ten oscillations in forty-nine seconds.

Upon eight and ten poles, ten oscillations in forty-seven and a half seconds.

By Duhamel's and Æpinus's methods, ten oscillations in forty-seven and a half seconds.

4. *A plate eight inches long, fourteen twenty-fifths wide, and one twenty-fifth thick.*

When rubbed upon *one* pole, ten oscillations in seventy-three seconds.

Upon *four* poles, ten oscillations in sixty-two seconds.

Upon *ten* poles, ten oscillations in fifty-nine seconds.

At an inclination of 15° or 20°, on *two* poles, ten oscillations in fifty-three seconds.

At the same inclination on *four* and *ten* poles, ten oscillations in forty-nine seconds.

By Duhamel and Æpinus's methods, with *one* or more bars on each side, ten oscillations in forty-nine seconds.

5. *Bar of steel sixteen inches long, six tenths wide, and one fifth thick.*

By magnetising it on Æpinus's method, with *two* moveable bars rubbing on its surface, it performed ten oscillations in a hundred and ten seconds, and was found to be saturated. By Duhamel's method, it required moveable bundles of four bars each.

6. *Bar of steel sixteen inches long, one inch broad, and nine twenty-fifths thick.*

When magnetised by Æpinus's method, with bundles of four, or even ten bars, it performed ten oscillations in a hundred and fifty-three seconds.

But by Duhamel's method, with even *ten* bars, it only performed ten oscillations in a hundred and sixty-two seconds.

Hence the magnetic force communicated by the first method was to that of the second as nine to eight.

Directive force of needles.

Captain Kater made a series of interesting experiments on the directive force of needles, produced by different

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[1] *Ann. de Chimie*, vol. lvii. p. 442.

Description of Magnetical Instruments.

methods of magnetising them. The needles which he used were right-angled parallelograms, five inches long, the one seven tenths of an inch broad, and the other three and a half tenths. The broadest was made thinner till it had the same weight as the other, which was 142 grains. The following table contains the result of the experiments.

	Directive Force.	
	Small Needle.	Large Needle.
1. The magnets placed perpendicularly on the centre of the needle, and the needle rubbed from end to end on both sides..................	655	674
2. The same, but the magnets separated at top in the same way as at bottom..................................	595	580
3. The same as number one, but the distance of the lower ends of the magnets two and a half inches....	760	780
4. The magnets joined on the centre of the needle, and each moved towards the nearest pole, then lifted up and joined again, and so on....	993	1155
5. The magnets being joined on the centre of the needle, their lower ends were made to move to each pole, their upper ends remaining in contact..............................	1025	1150
6. By Duhamel's method, the magnets inclined 45° to the needle, and moved from the centre to the poles..	1070	1170
7. The same, but the inclination of the magnets 20°......................	1085	1195
8. The same, but the inclination only 2° or 3°................................	1160	1275
9. Magnets laid flat on the needle, and drawn from the centre to the end..	1158	1261
10. Same as number eight, but the separated ends of the magnets connected by an iron wire.............	1145	1261
11. Wire removed, and experiment number eight repeated..............	1260	1273
12. Needles hardened at a bright red, and then softened from the centre to within three fourths of an inch of their extremities, and magnetised as number eight............	1815	1665

Captain Kater next ascertained the effect of length on the directive power of needles. He cut two needles of equal weight out of the same plate of steel, the one being *five*, and the other *eight* inches long.

13. Magnetised to saturation as in number eight..........................	1193	2275
14. Hardened and tempered beyond the blue, from the middle to within an inch of the poles..................	1865	2277

Hence it follows, as Coulomb had ascertained, that the directive force of needles whose length exceeds five inches is probably as their lengths.[1]

CHAP. XI.—DESCRIPTION OF MAGNETICAL INSTRUMENTS.

Magnetical instruments.

The great importance and value of magnetical instruments, not only in the arts of navigation and surveying, but in the determination of the various and ever-changing phenomena of terrestrial megnetism, renders it necessary that we should enter with some detail into this branch of the subject. As a magnetic needle constitutes the principal, if not the essential part, of the greater number of magnetical instruments, we shall begin our observations with some details respecting the forms, description of steel, temper, and construction of magnetic needles.

SECT. I.—*On the best Form and Construction of Compass Needles.*

Form, &c. of compass needles.

The most valuable experiments on this subject are those made by M. Coulomb and Captain Kater. Those of Captain Kater are particularly important.

With regard to the material out of which the needle should be formed, Captain Kater found that needles of *shear steel* received a greater magnetic force than those of *blister steel* or *spur steel*, those of *cast iron* being much inferior to the others.

Coulomb's experiments.

The next object of inquiry was to ascertain the form of the needle which is best suited for receiving the greatest directive power. The forms which have been generally used are, the cylindric, the prismatic, that of a rhomb or a parallelogram, and that of a flat bar which tapers to its extremities like an arrow. According to the experiments of Coulomb, the form last mentioned, "*une lame taillée en flèche*," was the best, and was susceptible of a greater directive power than those which had the form of a parallelogram. He found that any expansion of the needles towards these poles was accompanied with a loss of power; and he drew the general conclusion, that in needles of the same form, their directive forces are proportional to their masses. Captain Kater likewise found that the directive force was little, if at all, influenced by the extent of its surface; but that it depended almost wholly on the mass of the needle when it was saturated with magnetism.

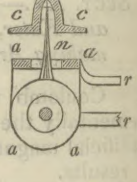
Captain Kater's experiments.

Captain Kater compared needles that had the form of a wide and a narrow rectangular parallelogram, and a small rhombus, a large rhombus, and a pierced rhombus, and he found that the form of the pierced rhombus is decidedly the best. A needle of this form (the sides of the rhombus are a little rounded in the figure), as made by Dollond, is shown in fig. 10, Plate CCCXXVI., the cross piece at the centre being made of brass or copper.

With regard to the best mode of hardening and tempering needles, Captain Kater found, that when a needle is considerably hardened throughout, its capacity for magnetism is diminished. He found that the needle was susceptible of the greatest directive power when it was first hardened uniformly at a red heat, and then softened from the middle to within an inch of its extremities, by using a degree of heat which is just capable of making the blue colour, which is thus produced, to disappear. Captain Kater likewise found that the polishing of the needle, previous to its being touched, had no advantage; and that an increase of pressure of the touching magnets on the needle was sometimes injurious, and never useful.

When the needle is magnetised, it has a cap *cc* fitted into the opening in its centre, seen in fig. 10, Plate CCCXXVI., and about one fourth of an inch in diameter. This hollow cap is executed with great care, and is generally made of agate (garnet is much better). The interior curved surface, particularly the summit of it, requires the best workmanship. This summit rests on the pivot *n*, the point of which is wrought to an angle of from about 15° to

Fig. 75.



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[1] *Phil. Trans.* 1821, p. 104.

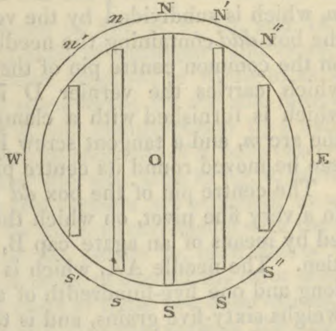
20°.[1] The use of the ring *a a* is to raise up the cap of the needle, and take it from the pivot when it is not in use. The rod or handle *r* of this ring is continued to the outside of the compass-box, where it can be put in motion, so as to disengage the needle from its pivot, or replace it at pleasure.

When a compass-needle is nicely balanced on a pivot, previous to its being magnetised, so as to traverse freely in a horizontal plane, it will no longer do so after it has been rendered magnetic. One of its ends will preponderate, in consequence of the tendency of the needle to dip, or place itself in a position parallel to the magnetic axis of the globe. In order to restore its equilibrium, therefore, it is necessary to add a small weight to one side of the needle, as shown in fig. 10 of Plate CCCXXVI. The weight requisite for this purpose will increase with the dip, so that it may be necessary to slide the weight farther from the centre in going towards the magnetic poles, and *vice versa*.

As the needle of ordinary compasses is generally placed upon a card on which the various points of the compass are marked, in stormy weather it is necessary to give weight to the card, to preserve it steady during irregular motions of the vessel. Various contrivances have been adopted to remedy this evil. The usual method is to load the card with sealing-wax. Some place pieces of paper, like vanes, on the lower side of the card, to act against the air, and check the vibrations; while others have proposed to make the needle move in oil or other liquid, with the same view. The consequence of these contrivances is, that while the weight of the card, or its resistance to motion, is increased, the directive power of the needle remains the same, so that in getting rid of one evil, another of greater magnitude is created. The mobility of the needle is diminished, and the steersman may mistake his course by trusting to the apparent steadiness of his compass. The simplest remedy for this evil is to use a heavier needle, with a greater directive power, or by combining several needles together.

This idea also has been proposed by Professor Barlow, who constructs the card as shown in the annexed figure, where NESW is the card, and NS, N′S′, N″S″, *ns*, *n′s′*, five parallel needles placed at equal distances. Mr Barlow has shown that the directive force of this combination of needles is nearly *four* times greater than that of a single needle; but as the weight and friction on the pivot is increased nearly in the same proportion, no other advantage is gained but the proposed one (particularly requisite in boat compasses) of making the cards steady by their additional weight, while the relative directive power remains the same.

Fig. 76.



Sect. II.—*Description of the Common and Azimuth Compass.*

The common compass, whether it is called the *mariner's compass* or the *land compass*, serves only to point out the direction of the magnetic meridian, while *azimuth* compasses enable us to determine the angular distances of objects from the magnetic meridian.

The common compass consists of a needle fixed to a circular card, containing upon its surface the thirty-two points of the compass. This card is balanced, as already described, upon a pivot fixed in the bottom of a circular box, and the top of the box is a plate of glass for protecting the needle from motions of the air. This compass-box, shown at AB, fig. 8, Plate CCCXXV., is suspended within a larger box PQ, upon two concentric brass circles or gimbals, the outer circles being fixed by horizontal pivots both to the inner circle, which carries the compass-box, and likewise to the outer box, the two axes upon which the gimbals move being at right angles to each other. The effect of this construction is, that the compass-box AB will retain a horizontal position during the motions of the vessel.

Description of Magnetical Instruments.

Azimuth compass.

The azimuth compass, shown in fig. 8, Plate CCCXXV. differs from the common compass principally in its being furnished with sights G, H, through which any object may be seen, and its angle with the magnetic meridian increased. For this purpose, the whole box is hung in detached gimbals CD, EF, which turn upon a stout vertical pin, seen above S′. In some instruments, the sights G, H may be turned down by a joint over the glass when the compass is not in use, as shown in fig. 7, Plate CCCXXV.; and in others they are connected by a brass bar, and may be taken from the compass when they are not wanted. In this compass, the card is divided on its rim into 360°; but the divisions are more frequently placed on a light metallic rim which it carries. The eye is applied to the sight H, which is a slip of brass containing a narrow slit. The other sight G, which is turned towards the object, contains an oblong aperture, along the axis or middle of which is stretched a fine horse hair or wire, which is made to coincide with or pass over the object or point whose angular distance or *azimuth* from the magnetic meridian is to be determined.

It is extremely difficult, when the ship is in motion, for the same person to take the bearing of the object and read off the angle; and various contrivances have been adopted to remedy this great defect. One of these is to have on one side of the compass-box a nut, which, when pressed by the finger, pushes a lever against the card, and stops its motion, so as to allow the angle to be read off at leisure; but a false reading is often obtained with this contrivance.

Sect. III.—*Account of Captain Kater's Azimuth Compass.*

Kater's azimuth compass.

This ingenious compass may be regarded as an universal instrument, capable of being advantageously used both at sea and on land. It is represented in detail in figures 7, 10, and 11, of Plate CCCXXV. In fig. 10, AB is a cylindric box made of brass, one inch deep, and covered with glass, and contains a card CD, five inches in diameter. The needle NS has an agate cap set in brass, and fixed in its centre. The needle is fixed to a circular piece of talc, on the circumference of which is laid a narrow ring of card, which is graduated to half degrees on its outer margin. On the inner side of the box there is fixed a standing piece of ivory, which just projects over the outer margin of the graduated circumference of the card, and an index-line is engraved on the ivory as a point of departure for reading off the divisions on the card. A brass sight-frame GH is fixed by a hinge at H, on the opposite side of the box. It has the form of a parallelogram, and is five inches long. A frame EF, two inches long, slides up and down upon GH, and contains the segment of a glass cylinder, whose radius is five inches. When the solar rays fall upon this cylindrical bar, they are collected into foci which form a line of light which is thrown upon the index-line of the

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[1] Coulomb, *Mém. de l'Institut.* tom. iii. has shown that this is the best angle for pivots.

Description of Magnetical Instruments.

piece of ivory, and which may be seen at the same time as the divisions on the card. The frame GH, when folded down, as shown in fig. 7, acts upon a lever L, which raises the needle NS, and prevents it from traversing, by pressing it against the glass cover.

The sight-hole to which the eye applies itself is shown at P, figs. 10 and 11. It is an inch from its hinge to its summit, but may be raised higher by means of grooves, in which a branch below the joint covers it, as seen in the figure. The upright plane P has a slit S terminating below in a circular aperture, which receives a convex lens. To this is fixed a horizontal plane H, having a lens in its centre; and above this, inclined to it at an angle of 45°, is placed a mirror M, by means of which and the lenses, an eye looking through the lens below S sees magnified the divisions on the card, distinct vision being produced by sliding the sight upwards or downwards.

In order to take the sun's azimuth, raise the object-sight GH, and slide the cylindrical lens EF till its luminous line or focus falls upon the index. The eye-glass sight P is then to be moved up and down till it gives distinct vision of the index-line on the ivory. If the line of light is not narrow and well defined, incline the sight GH towards the compass till it is so, care being taken that the sight is perpendicular to the horizon, between the observer and the sun. When this is effected, incline the compass to the observer, so as to check the oscillations of the card, by bringing it in contact with the index and two pins fixed near it for the purpose. When the card is made steady by the repetition of this, taking care that the compass is inclined as much from the observer as will just free the card from the index, and that the line of light is bisected by the index-line, this lens will indicate on the card the azimuth of the sun required, which, when the correction on the card is applied to it, will give the true azimuth of the sun from the magnetic meridian; and by means of this element and the observed altitude, the variation of the needle may be obtained in the usual way.

In using this compass for surveying, the cylindrical lens is slid to the top EG, and the hair or wire GH is then seen; and when this hair is made to bisect any object seen by direct vision, we have only to read off the azimuth of that object as seen on the card viewed by reflection.

By turning back the reflecting sight P round its hinge, the line of light may be viewed on the index, and the angle read off by direct vision, a mode of observation which has its advantages.

Sect. IV.—*Account of the Variation Compass.*

Variation compass.

The very complete instrument for measuring, with the nicest accuracy, the variation of the needle, and ascertaining its diurnal changes, which we have represented in Plate CCCXXVI. fig. 2, was constructed in Paris, we believe by M. Gambey, and has been described by M. Pouillet. All the parts of it which are of metal are executed in copper. A table NN of white marble supports the pillars and case of the instrument. The columns C, D are those by which the needle is suspended, and E, F, G, H, those which support the microscopes M, M′. The box of the needle is shown at B, B′, and the needle itself AA′ is placed in the small copper ring *o p*, to which is fastened a wire or a number of silk threads without torsion, which suspend the needle, and which may be rolled round the small cylinder seen between *c* and *d*, and turned round by the milled head *e*. This wire is kept in the centre of the little graduated circle *cd*, by crossing at that centre a small triangular aperture. The wire is enclosed in a small cage of glass, which rises between the two columns C, D, in order that the air may neither be agitated, nor penetrate into the box. By turning the milled head *e*, the needle AA′ may be raised or depressed at pleasure. Two moveable panes of glass shut up the apertures A, A′ of the box, which are above the two ends of the needle. Upon each of the extremities of the needle there is firmly fixed a small plate of ivory *mn*, *m′n′*, bearing a very minutely divided scale, each of the divisions having the angular value of 15′ or 20′.

When the apparatus has been placed as nearly as possible in the plane of the magnetic meridian, and carefully levelled, we must see that the silk thread is without torsion; and by a few trials the microscopes M, M′ may be directed so as to see the zero or index of the ivory scales at the ends of the needle. It is then easy to observe the displacements which the needle experiences, either by counting the divisions which have passed under the wire of the microscope, or by following its motions by means of the screw by which the microscopes are moved. Small microscopes, one of which is shown at *a*, and moveable round the rods *b*, *f*, are used to read off the position and course of each microscope M, M′ along the bar which carries it, and which regulates its lateral motion.

The telescope T is used for counting more conveniently, and consequently more correctly, the oscillations of the needle, when we wish to employ it for measuring the magnetic intensity. It carries before its object-glass a mirror, which reflects the vertical rays along the axis of the telescope.

Sect. V.—*Description of Colonel Beaufoy's Variation Transit.*

Beaufoy's variation transit.

This instrument, which was employed by Colonel Beaufoy in the valuable series of magnetic observations which he made between the years 1813 and 1821, is represented in perspective in Plate CCCXXVI. fig. 4, where EF is a mahogany board, which forms the support of the instrument, resting on three screws G, H, I, by which it can be levelled. Above this is a flat plate of brass EE, fixed to the board by a centre pin, and resting upon three studs projecting from the board. It has a small horizontal motion round the centre pin, by means of the screw W and milled head X. The plate EE carries the graduated arc *m*, which is subdivided by the vernier D projecting from the box *ddd* containing the needle AA. This box moves on the common centre pin of the plate EE. In the plate which carries the vernier D is fixed the frame *aab*, which is furnished with a clamp-screw L to fasten it to the arc *m*, and a tangent screw K, by which the box *ddd* can be moved round its centre pin.

The centre pin of the box *dd* and plate EE terminates in a very fine pivot, on which the needle AA is suspended by means of an agate cap B, for diminishing the friction. The needle AA, which is a cylinder, is ten inches long and one five-hundredth of an inch in diameter. It weighs sixty-five grains, and is terminated by two conical points; and it is furnished with the usual lever, &c. for lifting it from the pivot of suspension and lowering it again. There are within the box *dd*, and beneath the ends AA of the needle, two segments of brass, which have the centre lines drawn upon them; and these lines are brought to the points of the needle when the observation is made, by observing the coincidence through the double microscope M, which can be removed to the opposite end of the box.

The transit telescope OP rests on two pillars NN, fixed on the brass plate EE, and having at their summits small boxes *f* for the reception of the Ys, in which the pivots of the conical axis Q of the telescope are supported. At the end of one of the pivots of this axis is fixed a small divided circle R, on an arm of which, provided with a level S, are placed the verniers for reading

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off the divisions. The eye-piece *h* admits a dark glass for solar observation, and the wires of the eye-piece are adjusted by screws at *g*. There is also a detached level TV, whose feet *k*, *l* are placed in different directions upon the plate EE, for the purpose of levelling it. The use of the telescope is for finding the true meridian by means of the sun or stars, and the meridian should be indicated by fixed meridian marks.

When the instrument is properly levelled, and the telescope placed in the true meridian, the needle is allowed to settle, and the box *dd* is turned upon its centre till its mark comes near the point A of the needle. The clamp-screw L is then fixed to the arc *m*, and the screw K is turned till the coincidence of the index with the point of the needle is seen through the microscope M to be perfect. The vernier D will then show the exact angle of variation, or the declination of the needle from the true meridian.

Sect. VI.—*Account of Dollond's Variation Transit.*

Dollond's variation transit.

This instrument is shown in fig. 5 of Plate CCCXXVI. A brass pedestal CD, supported by three screws for adjusting it horizontally, forms the foundation of the four pillars which support the transit telescope AB, on the axis of which is fixed the graduated circle E, provided with all the usual contrivances for the accurate adjustment of the axis of the transit, and with microscopes for reading off the degrees. A cap or cover, seen separately at *a*, and containing a lens, is placed before the object-glass of the telescope, in order to convert it into a transit microscope, the focus of the lens being suited to the distance of the needle, seen between C and D, and the divisions of the graduated circle in the compass-box CD, the centre of the lens corresponding accurately with that of the object-glass. By this method the correct place of the divisions, as well as of the needle, may be readily ascertained, and the extreme deviation, as well as its diurnal changes, accurately determined. This instrument may also be used as a theodolite, and employed also for taking altitudes and equal altitudes.

Sect. VII.—*Description of Dollond's Diurnal Variation Instrument.*

Dollond's diurnal variation instrument.

This instrument is shown in figs. 8, 9, 10, and 11, of Plate CCCXXVI. It is made of mahogany and ivory, in order to avoid the attraction supposed to reside in all the metals. The needle *ns* is supported by the silk fibre *cbd* passing over a pulley at *b*, and counterpoised by a ball *d*. The two microscopes, seen on each side of *b*, have two cross wires, which, by means of the nut, seen in fig. 9, moving the frame to which the two verniers are attached, as well as the microscope, may be made to correspond with the index-lines on the ends of the needle *ns*, each end of the needle being observed, in order to correct the error arising from eccentricity. The mean of these two observations, as read off on the verniers, will give the angle of the diurnal variation. The needles used with the instrument are shown in figs. 10, 11; and there is also a piece of brass, of the same form and weight as the needles, in order to detect any twist in the suspending fibres of silk. This instrument might be used for measuring the magnetic intensity, by applying a contrivance for discharging the needle at the required angle. The diurnal part of this instrument was constructed for Captain Foster, who has published the observations which he made with it in the *Philosophical Transactions.*

Sect. VIII.—*Description of the Dipping Needle as constructed by Messrs Gilberts.*

Gilbert's dipping-needle.

After the dip of the needle was observed, and its changes discovered, instruments of various forms were contrived and used under the name of *aipping-needles*, for measuring the dip or inclination of the needle to the horizon. One of the most recent and complete of these instruments, as constructed by Messrs W. & T. Gilbert, is shown in Plate CCCXXV. fig. 9, in perspective. It consists of a brass plate CAB, supported by three screws A, B, C upon a flat board or stand. In the centre of this brass plate is another, ED, concentric with the former, and moveable round a centre pin like the moveable plate of a theodolite. This plate ED carries two levels at D for adjusting the plate horizontally. Four supports, shown at E and F, carry the circular box HGP, or principal case of the dipping needle NS. Two equal brass bars, one of which is seen at KL, are firmly fixed across the case in a horizontal direction. Other two brass pieces *m*, *n* are fixed by screws to the centre of the bars K, L, and carry two finely polished planes of agate, on which the axis of the needle NS rests, and upon which it turns freely. There is a contrivance inside the box G, and on the other side of K, L, not seen in the figure, by which the observer, by turning the milled head P, can lift, by means of Ys, the needle from the agate planes, or lower it upon them, at pleasure; the Ys being carefully adjusted, so as always to leave the axis of the needle on the same part of the agate planes, and in the centre of the divided circle. In this instrument the ends N, S of the needle are graduated so as to act as a vernier scale for subdividing the degrees of the divided circle into $6'$. A microscope is attached to the rim of the glass face, so as to be easily placed on any part of it, for the purpose of reading off the dip. In this instrument the length of the needle NS is six inches.

In order to obtain an accurate measure of the dip, several measures of it should be taken; *first*, with the face of the instrument to the east; *secondly*, with the face to the west; and the same observations repeated after the polarity of the needle has been inverted, or the north pole converted into a south pole, and the south into a north one. The mean of these four sets of observations will be the true dip required.

An account of Mitchell's dipping needle, as constructed by Nairne for the Board of Longitude, will be found in the *Phil. Trans.* for 1772, p. 476. The needles were a foot long, and the ends of the axes, which were made of gold alloyed with copper, rested on friction wheels four inches in diameter.

A complicated dipping-needle by Dr Lorimer, for determining the dip at sea, it described in the *Phil. Trans.*, 1775, p. 79.

The dipping-needle used by the Royal Society, and regarded as a model for instruments of this kind, is described by Mr Cavendish in the *Phil. Trans.* for 1776, p. 375. The axis of the needle rested on agate planes, and there was a contrivance, as in Gilbert's instrument above described, for raising and turning the needle upon the same part of the planes.

In one of M. Gambey's dipping-needles, executed at Paris, and intended to be used at St Petersburg, the axis, instead of being cylindrical, is a knife edge, as in delicate balances. This edge is placed exactly in the centre of gravity of the whole compound needles, and is so fixed, that when the needle dips 71° (as at St Petersburg), the edge rests perpendicularly on two agate plates. Such dipping needles, made for particular values of the dip, are admirably fitted for measuring minute variations of inclination, whether they be diurnal, menstrual, or annual.

Sect. IX.—*Account of Mr Scoresby's Magnetometer, for measuring the Dip of the Needle.*

Scoresby's magnetometer.

This ingenious instrument consists of a horizontal table, a leaf, or part of which, made of brass, may be set by a screw and pinion at any angle to the horizon; and this leaf contains near one of its edges two rings, through which we can pass a bar of soft unmagnetic iron, so that its length is perpendicular to the axis or line round which the brass leaf moves. On the same side of the leaf, and concentric with the above axis, is a graduated circle divided into 360°, so that when the bar of iron is put into the rings of the brass leaf, the bar coincides, in every position of the leaf, with a radius of the divided circle; and it is therefore easy to measure the angle which the bar makes with the horizon, whatever be the position of the leaf on which it rests. A compass is placed on the fixed leaf of the table, which by means of levels may be adjusted to a horizontal position.

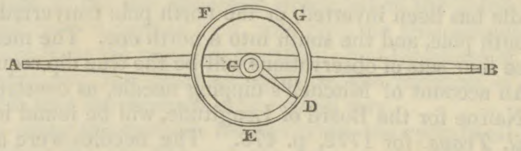
Now it has been ascertained by Mr Barlow, that when a bar of iron is in the magnetic equator, it loses all its power of affecting the needle of a compass placed near it. Mr Scoresby therefore elevates the brass leaf of the table, and consequently the bar of iron, till it ceases to act on the needle; and the complement of the inclination of the bar, as measured by the graduated circle, is the dip required. This method is of course not equal in accuracy to that described above, or to the methods of Meyer and Professor Lloyd, explained in subsequent sections. It may be used, however, most advantageously in obtaining an approximate measure of the dip when more delicate instruments cannot be procured. See the *Edinburgh Transactions*, vol. ix. p. 247; and the *Edinburgh Philosophical Journal*, vol. ix. p. 41.

SECT. X.—*Account of Daniel Bernoulli's Dipping-Needle.*

Bernoulli's dipping-needle.

If AB is a needle, C its axis, a light graduated circle DEFG is fixed upon it, so as to have its centre coincident with C, and a light index D is fitted to the axis C, so as to turn tightly upon it. Let the needle be magnetised previous to the putting on of the index D, and nicely balanced. The index will obviously destroy the equilibrium, and will always point perpendicularly to the horizon, if the needle has been properly balanced. As this degree of accuracy, however, cannot be expected, let the index D be set to different parts of the circle EFG, and let the inclination taken by the needle before it is magnetised be noted down, corresponding to the different positions of the index. When the index points to 50°, for example, let the inclination of the needle be 46°. If we now observe that the needle is still inclined 46°, when the index is at 50°, after it is magnetised, then 46° is the true magnetic dip at that place, as the magnetism which it has received does not alter the position which it assumes from its gravity alone.

Fig. 77.



As it is easy to obtain a rude estimate of the dip at any place, let the index D be set accordingly, and if the needle does not now show the estimated dip, the position of the index must be changed, and the inclination or dip of the needle again noted. Observe if this second position of the index, and the second measure of the dip, form a corresponding pair of numbers, such as have been written down. If they do we have got the true dip; but if they do not, another position of the index must be tried. If the coincidence of this new pair of numbers is greater or less than that of the former pair, we shall learn whether the position of the index is to be altered in the same direction as before, or in an opposite one.

Dr Robison made several observations with a dipping-needle of this construction, which was executed by a person totally unacquainted with the making of such instruments. He measured the dip with it at Cronstadt, at New York, and Scarborough, and the result never deviated more than $1\frac{1}{2}$° from that obtained by the present dipping-needles. He tried it also in a rough sea in Leith Roads, and he found it not inferior either in accuracy or despatch to the most elaborate instruments.

SECT. XI.—*Account of Mayer's Dipping-Needle, as constructed for Captain Sabine.*

The method of observing the dip employed by the celebrated Tobias Mayer,[1] consists in separating the centres of motion and of gravity of the needle, and in deducing the true dip from the apparent dip thus obtained.

The needle executed for Captain Sabine on this principle was a parallelopiped $11\frac{1}{2}$ inches long, $\frac{4}{10}$ths broad, $\frac{1}{20}$th of an inch thick. The ends were rounded, and a line drawn on the face of the needle through its centre to its extremities, for the purpose of an index. The needle turned upon a cylindrical axis of bell-metal, terminated by cylinders of the smallest diameter, that could support the needle without bending. These small cylindrical ends rested upon agate planes. The needle was raised from or lowered to its support by Ys, which insured that the same parts of the small cylinders rested on the agate planes in each observation.

A small steel screw was inserted in a female screw, tapped on the lower edge of the needle, in a direction perpendicular to the index line, and a small brass sphere was made to traverse on this screw, so that the centre of gravity of the needle, screw, and sphere, may be made to fall more or less below the axis of motion, and thus give the needle a momentum auxiliary to that of magnetism, in overcoming the inequalities of workmanship in the axis, or in the agate planes. Hence the position which the needle assumes, under these circumstances, is not that of the true dipping needle; but, by a simple formula, the true dip may be deduced from four observations, when conducted in the following manner:—

1. Place the needle in the magnetic meridian, and observe the angle which it makes with the vertical. Call this angle M.

2. Reverse the position of the axis on its supports, so that the edge of the needle, which was uppermost in the preceding observation, is now lowermost, and observe again the angle which the needle makes with the vertical, and call this *m*. Let the poles of the needle be now reversed by means of a powerful magnet, and when it is replaced, make the same observations which have been already described, and call the angles thus obtained N, *n*. Then calling the sum of the tangents of M and $m = A$; the difference of the same tangents $= a$; the sum of the tangents N, $n = B$, and their difference $= b$. Then the dip Δ may be obtained from the following formula:—

$$\text{cotan.}\ \Delta = \tfrac{1}{2}\left(\frac{A \times b}{a + b} + \frac{a \times B}{a + b}\right).$$

In order to insure the perfect horizontality of the agate planes, or of the axis of the needle which rests upon them, a spirit level attached to a circular brass plate, with adjustments to bring the level parallel to the plate, was placed upon the planes themselves. The errors of the level were shown by placing the plate in various positions, and the errors of the planes by turning the whole instrument on its horizontal centre.

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[1] *Göttingen Transactions*, 1814.

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If we observe the inclination of the dipping needle to the horizon in two different positions, so that the planes in which it moves are at right angles to one another, the true dip may be obtained from the formula:

$$\text{cotang.}\ {}^2\Delta = \text{cotang.}\ {}^2\text{I} + \text{cotang.}\ {}^2\text{I}'.$$

the inclination in the two rectangular azimuths being I, and I′. The dip may be thus very accurately obtained from the mean of a number of observations in different azimuths.

Sect. XII.—*Account of Professor Lloyd's method of observing the Dip and the Magnetic Intensity at the same time, and with the same Instrument.*

Professor Lloyd's method of observing the dip.

The ordinary dipping needle employed by Professor Lloyd, is supported on an axis which is supposed to pass accurately through its centre of gravity, and hence the position which it takes in the magnetic meridian is the direction of the magnetic force. If one of the arms of the needle, however, is loaded with a weight, the needle will assume a new position of equilibrium under the united influence of gravity and of terrestrial magnetism. By means of the inclination of the needle thus obtained, and the amount of the added weight, the dip of the needle, and the magnetic intensity, may be obtained by the following formulæ. Let μ, ν be the statical moments of two small weights attached in succession to the southern arm of the needle at fixed distances from its centre, and let ζ be the inclination obtained with the weight μ and θ that obtained with ν. Then

$$\mu \cos.\ \zeta = \varphi\, \sigma \sin.\ (\delta - \zeta),$$

$$\nu \cos.\ \theta = \varphi\, \sigma \sin,\ (\delta - \theta);$$

the dip being denoted by δ, and the magnetic intensity by φ, and σ being a constant depending on the distribution of magnetism in the needle itself. Hence from the inclinations ζ and θ observed in the usual manner, and the ratio of the moments μ and ν, the dip and the relative magnetic intensity will be obtained at the several places of observation.

The most advantageous way of applying the preceding method, Professor Lloyd considers to be this: He observes the position of the needle, *first*, when *unloaded;* and *secondly*, when loaded with a weight sufficient to bring it into a position nearly perpendicular to the line of the dip.

Now, if $\mu = o$, we shall have $\zeta = \delta$, or the inclination first observed becomes equal to the dip, when there is no weight acting with or against the directive force. This condition, however, is never accurately fulfilled, for, from the imperfect coincidence of the centre of gravity of the needle with the axis, the weight of the needle itself is sufficient to deflect it from the true line of the dip. We must, therefore, regard ζ as the approximate value of the dip, and compute the correction for reducing it to its exact value.

For this purpose put $\varrho = \frac{\mu}{\nu}$, and dividing the first of the above equations by the second, we have

$$\varrho \frac{\cos.\ \zeta}{\cos.\ \theta} = \frac{\sin.\ (\delta - \zeta)}{\sin.\ (\delta - \theta)}$$

Then if we make $\delta = \zeta + \epsilon$ the second term of the preceding equation becomes $\frac{\sin.\ \epsilon}{\sin.\ \zeta - \theta}$ *q.p.* since ϵ is a very small quantity, and we have

$$\sin.\ \epsilon = \varrho \frac{\cos.\ \zeta}{\cos.\ \theta} \sin.\ (\zeta - \theta).$$

Hence we may find the dip by means of these two equations, and we may deduce the correction for an imperfect balance of the needle from the two observed inclinations, without reversing the poles of the needle, as in the method of Tobias Mayer.

The value of the coefficient ϱ in the last equation is given in the following formula:

$$\varrho = \frac{\cos.\ \theta.\ \sin.\ (\delta - \zeta)}{\cos.\ \zeta \sin.\ (\delta - \theta)}.$$

The magnetic intensity at different stations may be obtained from the dip by the second equation.

The quantity σ being the statical amount of the free magnetism of the needle, or the *magnetic moment*, must vary with the temperature. If τ is the temperature of observation, τ' a certain standard temperature, and σ' the corresponding value of σ, then if we suppose the changes of σ to be proportional to those of τ, we have

$$\sigma = \sigma' (\text{I} - \alpha) (\tau - \tau')$$

α being a constant to be determined by observation, and which Professor Lloyd found to be 0.00016.

The quantity ν is the sum (or difference) of the moments of the weight of the needle, and of the added weight, and its value is

$$\nu = \nu' (1 - e \cos.\ 2\ \lambda)$$

where ν' is the value of ν corresponding to the latitude of 45°, λ the latitude of the place, and e a constant, whose value is 0.002588. Hence we obtain for the magnetic intensity

$$\varphi = \frac{\nu' \cos.\ \theta}{\sigma' \sin.\ (\delta - \theta)} + \frac{1 - e \cos.\ 2\ \lambda}{1 - \alpha (\tau - \tau')}$$

an expression peculiarly adapted for logarithmic computation. See *Memoirs of the Royal Irish Academy* 1835.

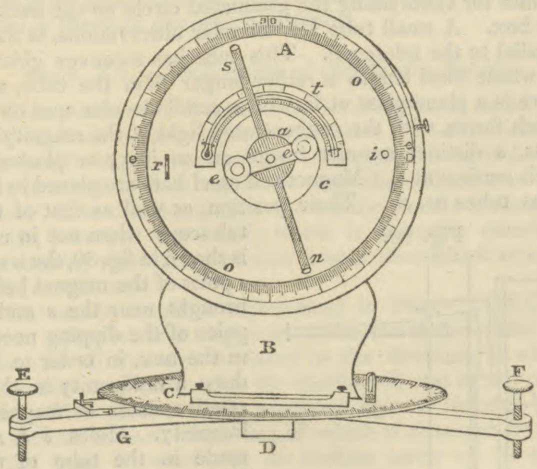
Sect. XIII.—*Description of Mr Fox's Dipping Needle Deflector, for measuring the Variation and Dip of the Needle, and the Magnetic Intensity.*

Mr Fox's Deflector.

This ingenious instrument, for ascertaining the variation, dip, and intensity of terrestrial magnetism, has been pretty extensively used by Mr Fox in different parts of the united kingdom. The results have been published both in a table and in a chart in an extract from the Report of the Royal Cornwall Polytechnic Society for 1835.

The deflector is shewn in the annexed figures, where A is a cylindrical box of brass fixed vertically in the stem B and horizontal plate C, all of which can be turned round on their common axis D, ground into the centre of a tripod, two of whose legs are shewn at E and F. The graduated circle in C is subdivided by a vernier and tangent screw G, levels being placed at right angles to each other for adjustment. The needle *ns*, with a small grooved wheel *a* fixed

Fig. 78.



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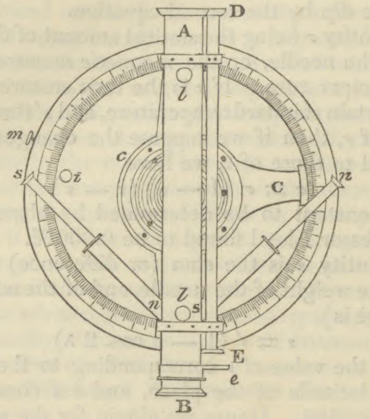
on its axis, is supported by the concentric disc *c*, and a bracket *e* attached to the disc, the axis of the needle moving in jewelled holes. The disc *c* is accurately fixed into the back of the box, and may be turned round with the bracket on its axis by means of knobs on its back, shewn in the annexed figure. By this contrivance the bracket may be moved round to any convenient position, so as not to interfere with the dip of the needle in any latitude.

Fig. 79.



The socket *v*, fixed to a brass spring, when pressed forward by the screw *m*, is intended to confine the ends of the needle when not in use. There are two parallel graduated rings, one of which is a little within the outer surface of the dipping needle, as shewn at *oo*, fig. 78.; the other ring, supposed to be removed in the figure, is immediately under the glass, its object being to direct the sight, and enable the observer to subdivide the degrees on the inner circle. A thermometer is shewn at *t*. The back of the dipping needle box is shewn in fig. 79.; the back of the moveable central disc is grooved, and a brass rod is drawn over the grooved surface in order to make the needle vibrate.

A telescope AB, having cross wires, is capable of being moved in a vertical plane in any direction, by means of a concentric ring *c*, grooved into another concentric ring attached to the back of the instrument, and furnished with a flanch. An arm C, at right angles to the telescope, has a vernier for subdividing the graduated circle on the back of the box. A small tube DE for solar observations, is fixed parallel to the telescope. This tube has a convex glass at D, whose focal length is rather longer than the tube, and there is a plane glass at E, with a small circular spot on it, which forms, with the concentrated light of the magnifying glass, a distinct annular image on an ivory or plaster of Paris surface at *e*. Magnetised steel bars are placed in the brass tubes *ns*, *sn*. Their position, as well as that of the telescope, when not in use, is shewn in fig. 80, the *n* and *s* poles of the magnet being brought near the *s* and *n* poles of the dipping needle in the box, in order to induce a uniformity in their relative states of magnetic intensity. Holes *l l* are made in the tube of the telescope, to allow the magnets to be passed through it, and screwed into the arms which hold the telescope. This is shewn at *n* and *s* fig. 79, which represents a side view of the box, and the places of the magnet when employed for ascertaining the intensity. Screws for fixing the ring and glass cover, over the face of the instrument, are shewn at *a a*.

Fig. 80.

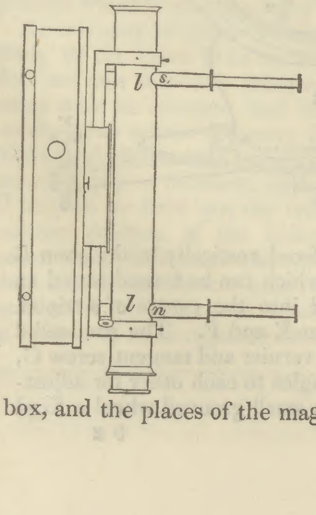


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Fig. 81.

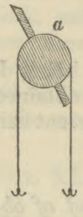


Fig. 81. represents a grooved wheel fixed in the axis of the needle *a*, with a fine silk thread, having hooks at each end, passing over the wheel in the grooves.

The following rules for using the instrument are given by Mr Fox:—

To observe the Magnetic Variation.—Ascertain the true meridian by any of the usual methods; the small tube being used for solar observations, and the telescope for observations at night. Note the angle cut by the nonius on the circular plate C. If the plate be turned round 90° from that point, the face of the instrument, or rather the plane in which the needle moves, being parallel to that of the tubes, will be at right angles to the plane of the true meridian. The deflecting tubes *n s* having been removed from the back, turn the instrument round *gradually*, so that the needle may become *perfectly vertical* after vibration; friction having been employed several times at the back of the central disc. Fig. 79.

The face of the instrument will then be at right angles to the plane of the magnetic meridian; and the angle described on the circular plate will give the variation from the true meridian. The face of the instrument, however, should always be turned round to the opposite quarter, till the needle again becomes vertical, which will either confirm or correct the preceding experiment, by taking half the difference between the two observations.

To ascertain the Dip.—The face of the instrument having been made to coincide with the *plane* of the magnetic meridian, suppose it to be at first turned toward the east; note the exact dip at *both* ends of the needle after vibration, as before described; (this precaution should, in every case, be carefully attended to, and repeated several times); then turn the face of it toward the west, placing it in the same plane, and observe and note as before; the mean of these observations will give the dip.

To correct the observed Dip.—The instrument being still in the magnetic plane, and fixed in that position by means of the lever or clamp, connected with the nonius, screw on one of the deflectors *n s* at right angles to the tube, as shewn in fig. 80, so as to repel or deflect the end of the needle which is nearest to it; then, if the observed dip was 69°45′, move the deflector a certain number of degrees from 69°45′, as shewn by the nonius *c*; say 50° to the right of the dip, when the needle will be repelled in the opposite direction; suppose the mean angle at *both* poles of the needle, after frequent vibrations, to be . . . 54°33′
then move the tube 50° to the left of the dip, when the needle will be repelled in the contrary direction: suppose it to stand at . . 84°47′

Mean, . 69°40′

If the face of the instrument, whilst making these observations, should be towards the east; turn it round towards the west, adjusting it in the same plane, and repeat the observation; if the mean result should be . . 69°46
the mean or corrected dip will be . . . 69°43

Similar observations may be multiplied at pleasure, by varying the angles of the deflector from the observed dip; and by thus taking the mean of many observations, the true dip may be obtained with a great degree of precision.

To find the relative Intensity of the Terrestrial Magnetism. The instrument being still in the plane of the magnetic meridian, screw the deflectors (or one of them) into the arms at the back of the instrument, as shewn in fig. 79, and cause the latter to coincide with the direction of the dip, when the needle will be repelled from it; mark the angle to which the needle points at both ends (after repeated vibrations as before described), then cause the needle to swing back to the other side of the dip (one of the deflectors being temporarily removed for this purpose), and note its place as before: half the sum of the angles to which the needle is thus deflected (or rather of their sines) will represent the relative force of the terrestrial magnetism, at different places, on a needle thus circumstanced. It is desirable that the observations should be made with the face of the instrument turned towards the east as well as towards the west; and likewise only one deflector may be used as well as both of them, in order to vary and multiply the observations for the purpose of correction.

If the angle of deflection at a second place of observations should be greater or less than at the first, the force of the earth's magnetism will be inferior or superior to the latter, as represented by the different angles.

The amount of any such difference may, when required, be represented by weights:—For this purpose, the glass which protects the face of the instrument should be removed, and the silk thread placed on the grooved wheel, as shewn in fig. 81. The minute weights required to be suspended to one of the hooks, in order to bring the needle to some given angle from the actual dip, will indicate the relative magnetic intensity at different stations. Suppose, for example, that at a given place, the observed dip is 70°, and that at a second place, in a lower latitude, it is 45°; adjust the deflectors as before described, so as to coincide with the dip of the needle at the place of observation, whatever it may be. Assume that the needle is repelled 70° from the dip of 70° at the first station, and 80° from the dip of 45° at the second station; it will shew that the terrestrial magnetic intensity is greater at the former than at the latter. The weights required to be suspended to one of the hooks, in order to bring the needle to its original position of 70° from the dip (if that be taken as the standard) will indicate the difference of intensity. Thus, for instance, if five-tenths of a grain be required to bring the needle from the angular distance of 80° to that of 70° from the dip at the second station; this weight will indicate the *difference* of the magnetic intensity of the earth at the *two* stations, acting on the needle in question, when at an angle of 70° from the natural dip.

The ratio of this difference to the whole force of the terrestrial magnetism so acting, may be ascertained by moving the deflectors to the angle of 70° from the dip (because the needle is assumed to have been deflected to this angle at the first station), the needle will then be repelled to the opposite side of the dip, and the weight required to counteract the deflection sufficiently, to bring it back to the dip, will represent the whole influence of the earth's magnetism, at the first station on the needle, whilst at the angle of 70° from the dip. This will be evident, when it is considered that the angle between the needle and deflectors is in both instances the same; it being coerced, contrary to the repelling force of the deflectors, in one case by the earth's magnetism, and in the other by the weights, to the *dip or line of quiescence*. The earth's magnetic force acting on the needle so deflected, and the weights will therefore be equal to each other. If 3.34 grains be the weights required, and five-tenths of a grain equal to the difference between the two stations, the terrestrial magnetic intensity will be in the ratio of 3.34 — .5 = 2.84, at the second station, to 3.34 at the first station.

From the observations which have been already made with the dipping needle deflector, furnished with a needle less than six inches long, there is good reason to believe that it will clearly indicate a difference of intensity at places situated at less than one-half a degree of a latitude from each other.

Observations on the magnetic intensity and dip may likewise be made *without the deflectors*, by means of the weights only, suspended from the silk thread, shewn in fig. 81. This method is too obvious to require a minute description, the weights in this case being used to produce deflection from the dip at any place, instead of the magnetic deflectors: the weights required to cause a given amount of deflection being taken as the relative measure of the magnetic intensity at the place of observation. Thus, in the case before supposed, 3.34 grains would produce a mean deflection of 70° from the dip at the first station, and only 2.84 grains would do so at the second station.

Description of Magnetical Instruments.

Sect. XIV.—*Account of Lebaillif's Sideroscope.*

Lebaillif's sideroscope.

The object of this instrument, proposed by M. Lebaillif, is to detect minute degrees of magnetism by means of a very delicate combination of small magnetic needles. This apparatus, which he calls a *Sideroscope*, is shewn in Plate CCCXXVI. fig. 3, where ABCD represents the body of the instrument. The other parts consist of three sewing needles magnetised to saturation, and a tube of straw twelve or fifteen inches long. One of these needles, *a b*, is slid into the tube *m h*, and the others *a′ b′*, *a″ b″*, are placed across the straw, so that their dissimilar poles correspond. The straw thus fitted up is placed upon a small stirrup of paper, which is suspended by a silk fibre fixed at the top C, of the vertical tube of glass or wood C D. The portion *m h* of the tube of straw is the longest, and it is beneath its extremity *m* that there is placed on the bottom of the cage or box A B, an arch *r r r*, divided into degrees and half degrees. The portion *m c* has no directive force, as the action of the earth is neutralized in the two opposed needles *a′ b′*, *a″ b″*. But the portion *m h* has a directive force depending on the magnetism of the needle *a b*, on its length, and on its distance from the point of suspension. The cage has a small sliding door, *t p*, which shuts up the apparatus; and when an experiment is made, the aperture at *t* is brought opposite the extremity *a* of the needle.

Plate CCCXXVI. fig. 3.

M. Lebaillif has proved, that almost all bodies exercise some action on the needle, and that *antimony* and *bismuth* always exert upon it a repulsive force. M. Pouillet, from whose work we have taken this description of the instrument, is of opinion that the movement of the needle may be often owing to atoms of iron; and that we must not take it for granted that, in these phénomena, the magnetic force is the only one which is acting.

Sect. XV.—*Description of the Astatic Needle.*

Astatic needle.

This instrument, described by M. Pouillet, is called the Astatic Needle, because it is withdrawn from the action of the earth's magnetism, and has no longer the statical position in which it is in equilibrio with the influence of this force. The construction of the astatic needle is founded on the principle that a body which is moveable round an axis cannot receive any motion from a force which acts parallel to this axis.

Plate CCCXXVI. fig. 1.

The astatic needle is represented in Plate CCCXXVI, fig. 1, where *n s* is a magnetic needle, moveable round the axis *a b*. If this axis is placed in the direction in which terrestrial magnetism acts, the needle will rest in any position. This effect is easily produced by two motions perpendicular to each other, one of which is obtained by the milled head S′, which, by an endless screw on its axis, works in the teeth of the wheel C, and the other by the milled head S′ and the wheel D. The graduated circle AB shewing the positions of the needle.

Pouillet's astatic needles.

Another contrivance for an astatic needle is shewn in the annexed figure (82), where two needles AB, A′B′, perfectly alike in their form and magnetic intensity, are turned in opposite directions, and placed upon the same axis perpendicular to their length.

Description of Magnetical Instruments.

A more perfect compensation in the action of two needles, is shewn in fig. 83, where AB AB are the two needles, the one horizontal and the other inclined to the horizon. It is obvious that the directive force of the latter will augment with its inclination, and it is therefore easy to make the directive forces of each perfectly equal and opposite, by varying the inclination of the uppermost one. These two contrivances we owe to M. Pouillet.

Fig. 82.

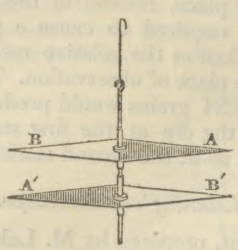
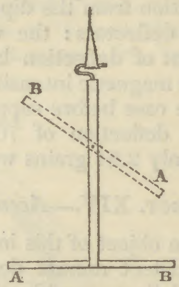


Fig. 83.



A magnetic needle may also be rendered astatic by neutralizing the action of the earth, by means of an equal and opposite magnetic action. For this purpose we have only to place a powerful bar magnet at a considerable distance from the needle, so that it may act upon it as powerfully as the earth does. It should be placed in the magnetic meridian, parallel to the direction which the needle takes when it is in equilibrio, the pole of the bar which repels that of the needle being placed nearest it. When the bar is placed near the needle, it will cause it to wheel round, in consequence of its action exceeding that of the earth. At a very great distance, on the contrary, the earth's action will predominate, and draw the needle into the magnetic meridian; but an intermediate distance will be found in which the two actions exactly balance or compensate each other, and render the needle astatic.[1]

SECT. XVI.—*Account of Barlow's Correcting Plate or Magnetic Compensator for neutralizing the effect of local attraction on the Ship's Compass.*

Barlow's correcting plate.

As every ship contains large fixed masses of iron, beside moveable iron guns, anchors, cables, and iron utensils of various kinds, it is obvious, from the principles and experiments already detailed (see Chapter V, &c.), that these masses, rendered temporarily magnetic by the action of the earth, must produce derangements in the magnetic needles of the compasses on board. These derangements amount sometimes to 15° or 20°, and have exposed navigators to the most imminent perils. Mr Wales, the astronomer to Captain Cook's expedition of discovery, first discovered the fact that such a deviation existed, but he does not seem to have suspected its cause. Mr Downie, master of his Majesty's ship Glory, was the first person who pointed out the true origin of the deviation. "I am convinced," says he, "that the quantity and vicinity of iron in most ships have an effect in attracting the needle; for it is found by experience that the needle will not always point in the same direction, when placed in different parts of the ship. Also it is rarely found that two ships, steering in the same course by their respective compasses, will go exactly parallel to each other, yet these compasses, when compared on board the same ship, will agree exactly."[2]

Description of Magnetical Instruments.

In his survey of the coast of New Holland, in 1801 and 1802, Captain Flinders observed great differences in the direction of the needle, which arose only from changes in the direction of the ship's head, the direction being westerly when the ship's head was to the east, and *vice versa*. Hence he concludes, that the attractive powers of the different bodies in the ship which are capable of affecting the compass are collected into something like a focal point or centre of gravity, and that this point is nearly in the centre of the ship, where the shot are deposited, for here the greatest quantity of iron is collected together."[3] He likewise supposes that this magnetic centre is of the same name as the pole of the hemisphere where the ship is, and consequently, that in New South Wales the south end of the needle would be attracted by it, and the north end repelled; and from this hypothesis he concludes that the phenomena must be exactly the reverse in the northern hemisphere.

The Admiralty ordered a course of experiments to be made on this important subject, but though they established the truth of Captain Flinder's views, the subject was not farther prosecuted. The public attention, however, was again called to it by Mr Bain, who, in an excellent treatise on the variation of the compass, pointed out the fatal consequences which might result from this great source of uncertainty in the indications of the needle. The observations of Captains Ross, Parry, and Sabine threw additional light upon the subject; but it is to Professor Barlow alone that we owe a series of brilliant experiments, which terminated in his invention of the neutralizing plate, for correcting in a perfect manner this source of error in the compass.

In order to give an idea of the magnitude of this error, Professor Barlow has published the following table of deviations actually observed:—

Ship.	Place.	Observers.	Deviation in the compass.
Conway	Portsmouth	Captain Hill	4° 32′
Leven	North fleet	Captain Owen	6 7
Barracouta	Do.	Captain Cuttfield	14 30
Hecla	Do.	Captain Parry	7 27
Fury	Do.	Captain Hoppner	6 22
Griper	Nore	Captain Clavering	13 36
Adventurer	Plymouth	Captain King	7 48
Gloucester	Channel	Captain Stuart	9 30

The instrument employed by Professor Barlow is shewn in the annexed figures, where T is a rod of copper an inch and a half in diameter, and FF′ two plates of iron about twelve or thirteen inches in diameter, and of such a thickness that a square foot of it will weigh about 3 lbs. avoirdupois. These plates are separated by a circular sheet of card, and pressed against each other at their centre by a screw on the end of the rod T, and at their margins by three small screws of iron. The compass C is placed on the tip of a wooden box B, and the corrector T is placed in one of the holes in the side of the box.

Fig. 84.

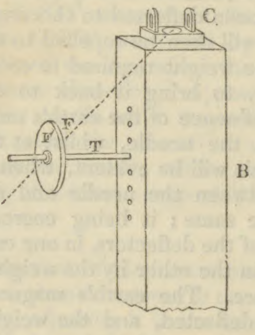
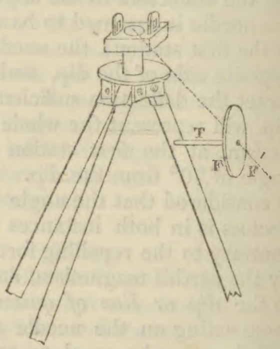


Fig. 85.



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[1] See Pouillet's *Elemens de Physique*.

[2] Walker on *Magnetism*, 1794, cited by Prof. Barlow.

[3] *Phil. Trans.*, 1805, p. 186.

Theories of Magnetism.

The adjustment of the plate is made when the ship is lying in a calm bay near the shore. An observer with a needle and theodolite is placed at some distance from the shore, from which he can perceive the ship while it is turning its head in different directions. The compass on board the ship is under the management of another observer with the same apparatus. At a signal given the observer determines the angle which his own needle makes with the axis of the telescopes (one being directed to the other), which is called the central line. But as the needle on shore experiences no disturbing action, it is evident that if the needle on ship-board also experience none, the two needles will be parallel, and will form the same angle with the central line. Hence the difference between these two angles when they are not the same is that which is produced by the magnetic action of the iron in the vessel from its compass needle at the instant of observation. Let the vessel be now made to turn round completely, and let a new observation be made at every azimuth of ten or twelve degrees, we shall then have the value of the deviation produced in all positions of the ship's head upon the compass needle. When this is done, the observer on shore takes away his compass and replaces it with that of the ship, which he sets on the wooden cage shewn in fig. 84, having different holes for receiving the axis T of the plate FF′. As the box B is turned round its axis it carries along with it the compensator FF′, which will affect the needle of the compass C differently in different azimuths, and by a few trials it may be adjusted by means of the holes of its axis T to produce the very same deviations in the compass as was produced upon it when in the ship by the action of its iron. When it is done the position of the centres of the plate FF′ with regard to the needle is completely marked, and when it is taken on board the ship and placed in its proper position, the compensator is adjusted on the stand which carries the compass, as shewn in fig. 85, so as to have exactly the same relative position as it had in the box B.

Now since the compensator produces the same effect as the iron on shipboard does, the deviation will be *doubled* in place of being corrected; but this furnishes the means of making the correction. If the variation is found to be 36° W. by the compass *without the compensator*, and afterwards 40° with the compensator, the difference $40° - 36° = 4°$ shews that the compensator augments the variation 4°, and the iron on board the vessel as much. Hence the true variation will be $36° - 4 = 32°$, or $40 - 4 - 4 = 32°$. If the observations with the compensator had given a less result than without it, this would have shewn that the action of the iron had diminished the declination, and the difference of the two observations must have been added to the first to have the true declination.

CHAP. XII.—THEORIES OF MAGNETISM.

Theories of Magnetism.

The phenomena of magnetism, like those of every other branch of physics, have afforded the groundwork of many absurd and wild theories. The hypotheses of Descartes and Euler, which created in the interior of magnetic bodies canals and valves to admit or obstruct the subtle matter, to the agency of which they ascribed the attractive or directive power of magnets, are too ridiculous to deserve any notice in the present state of the science.

Theory of Æpinus.

M. Æpinus of St Petersburg was the first philosopher who discovered a rational hypothesis, which explained nearly all the phenomena of magnetism. This hypothesis of one fluid, however, of which we have already given a short account in our history of the science, was found insufficient for explaining the phenomena which are exhibited in the division and fracture of magnets, and that it was susceptible of a correction, which consisted in considering a magnet as composed of small particles of iron, each of which has individually the properties of a separate magnet, yet it did not afford a complete explanation of all the magnetic phenomena.

Theory of Wilcke, &c.

The hypothesis of two fluids, which was first proposed by Wilcke and Brugmann, was established by M. Coulomb and has recently been perfected by the masterly investigations of M. Poisson, who has not only constructed mathematical formulæ which enable us to calculate all the minutest details of the phenomena, but has enabled us to comprehend physically how all the phenomena have been produced. The general equations at which he has arrived have not yet, in every case, been resolved; but the particular conditions under which the integrations are possible have already, as we have stated, exhibited the most happy coincidence with experiment.

The hypothesis of two fluids supposes that they reside in each particle of iron; that they are neutral, and inert when combined as in soft iron; and that, when they are decomposed, the particles of the *austral* fluid attract those of the *boreal* fluid, and *vice versa* while they each repel one another.

In order to account for the phenomena of the division and fracture of magnets, it is necessary to suppose, that when the united fluids are decomposed, the fluids undergo displacement only to an insensible distance. The minute portions of a magnetic body within which the motions and displacements resulting from decomposition take place, or in which magnetism exists, are called the *magnetic elements* of that body, and the small intermediate spaces where magnetism is not found, the *non-magnetic* elements. It is impossible to determine whether the *magnetic elements* are the intervals which separate the ultimate atoms of material bodies, or if they are the atoms themselves; nor can we ascertain whether they are the intervals between an aggregate number of atoms, or of a secondary molecule, or the aggregate members themselves. The theory regards the sum of the magnetic elements, and of the non-magnetic elements as forming the apparent volume of a body. The ratio of these two sums may change with the nature and temperature of the body; and these changes exercise a powerful influence over the distribution and intensity of magnetism.

The quantity of each fluid in every magnetic element is unlimited in reference to our powers of separating them, as the united fluids can never be completely decomposed. The force which prevents this decomposition, and also the recombination of the fluids, is called the *coercive force*, and, like that of friction, it cannot be completely overcome. In soft iron, this coercive force is extremely feeble. In the natural loadstone, and in steel, it is very powerful, varying in intensity in different kinds of this metal.

One of the most important consequences of the theory of Poisson is, that a magnetic needle whose size is so small that it exerts no sensible action on an iron sphere within which it is placed, will intercept the magnetic influence of the earth, and of all magnetic bodies without the sphere; and, in like manner, such a sphere will intercept the action of a magnet within it on all bodies without it. Another interesting consequence of the theory is, that in a hollow iron sphere, magnetised by the influence of the earth, or of any magnetic force, the origin of which is at such a great distance that it may be considered as acting in parallel lines, although the magnetism is not confined to the surface of the sphere, and though its intensity may be determined for any particular point of the solid mass of the shell, yet it is determined only by the radius of the external surface, and the co-ordinates of the point upon which the forces act. When this point is very remote from the centre of the sphere compared with its diameter, each of the three forces is nearly in the direct ratio of the cube of the radius, and in the inverse one of the cube of the distance.

M. Poisson has likewise applied his powerful mind to the explanation of the singular phenomena of magnetism produced by rotation. To the suppositions which his theory makes in order to explain the phenomena of magnetism induced by influence, he adds another, namely, that all bodies exert upon the *boreal* and *austral* fluids a species of action analogous to the resistance of media, which action has the effect of retarding the motion of the two fluids in the interior of the magnetic elements; and he conceives that it is this species of resistance, and not the coercive force, which has an influence over the magnetic phenomena of revolving bodies. Hence, if we bring a magnet near any body on which the coercive force is insensible, and in which the magnetic elements are in any proportion, the decomposition of the neutral fluid will begin immediately, and will continue till the action of the free fluid is in equilibrio with the external force, which will certainly take place if this force is constant in magnitude and direction. But if it varies continually, or if the loadstone changes its position, the two fluids, in place of arriving at a permanent state will move in each element with velocities dependent, other things being equal, on the resistance which the substance of the body opposes to them.

It is needless to enter into any further details respecting this very ingenious theory, as the recent discoveries of Mr Faraday respecting electro-magnetic induction have enabled him to give a most satisfactory explanation of the diversified phenomena of magnetism in motion.

(N. N. N.)

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Fig. 1.

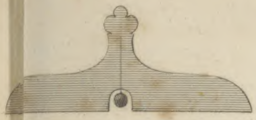
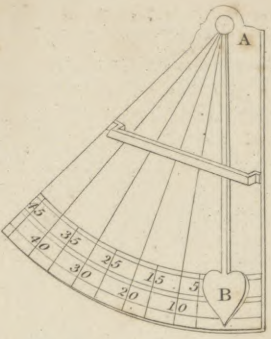


Fig. 3.



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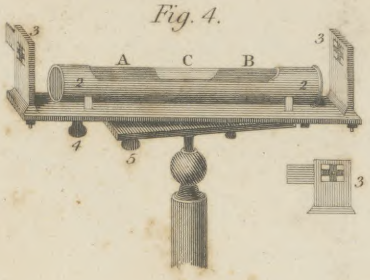
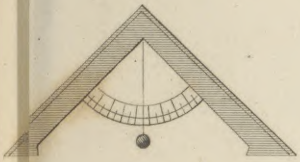


Fig. 2.



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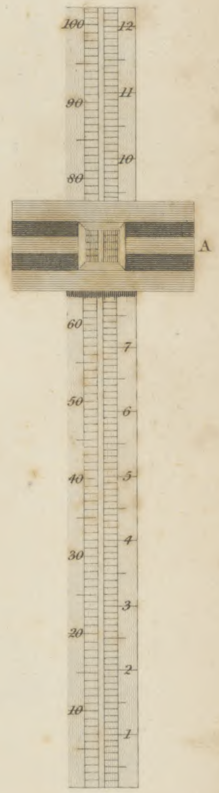

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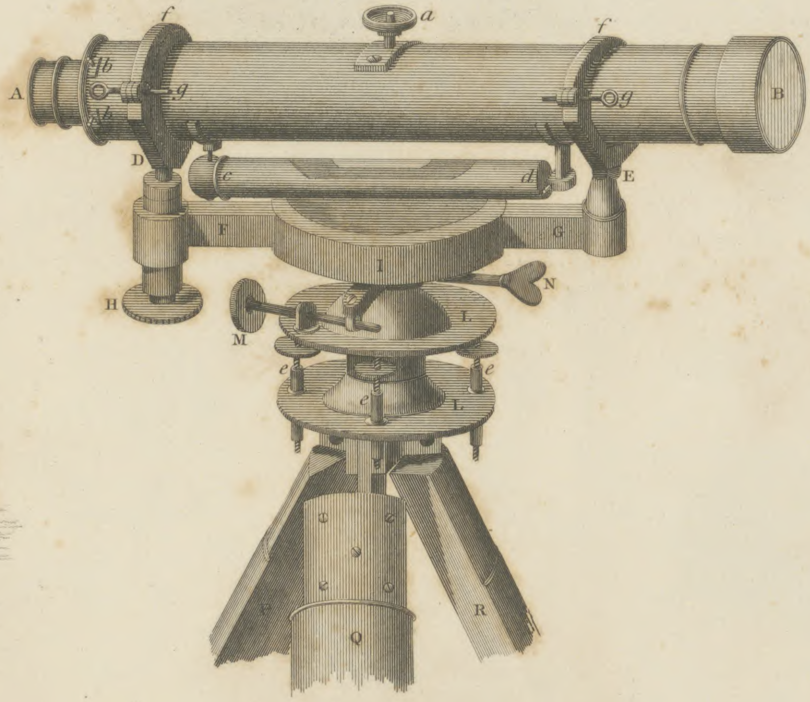

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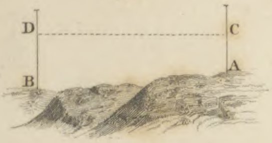

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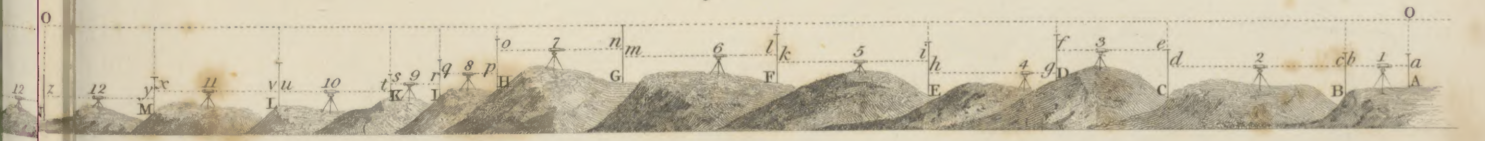

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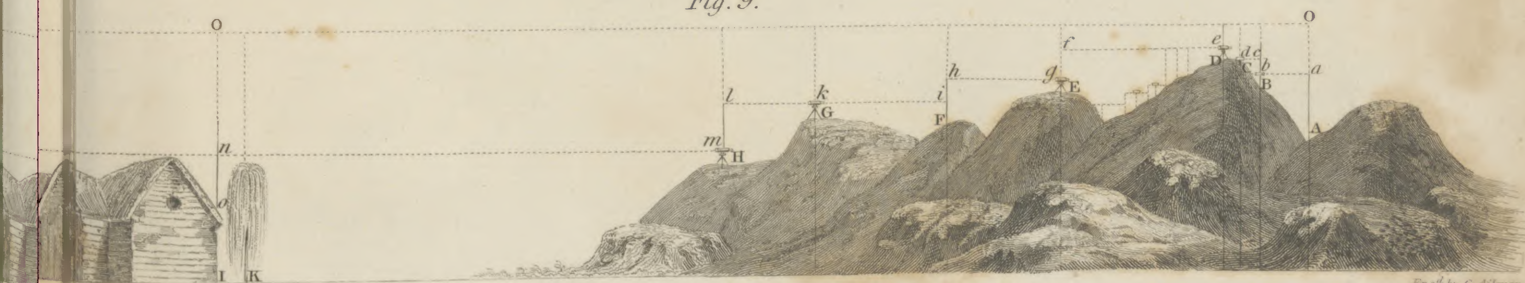

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Fig. 1.

Fig. 2.

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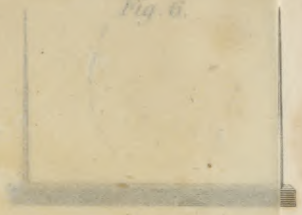
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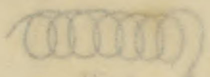
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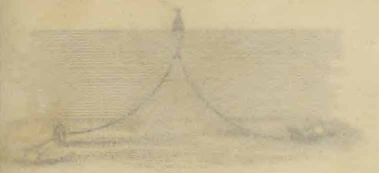
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Fig. 15.

Fig. 16.

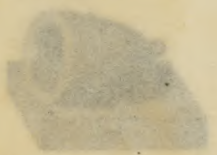
Fig. 17.

Fig. 18.

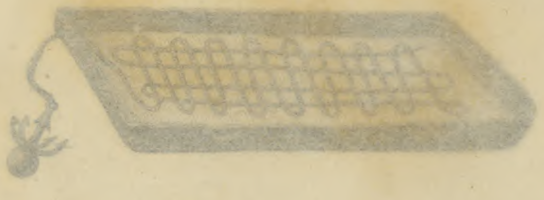
Fig. 20.

Fig. 19.

Fig. 21.

Fig. 24.

Fig. 23.

Fig. 22.

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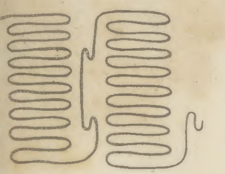
LIFE-PRESERVERS.

PLATE CCCXXIII.

Fig. 1.



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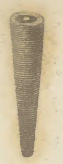

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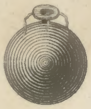

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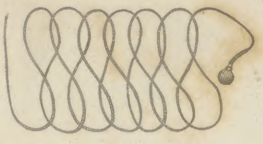

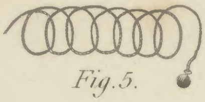

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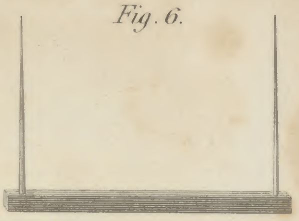

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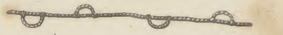

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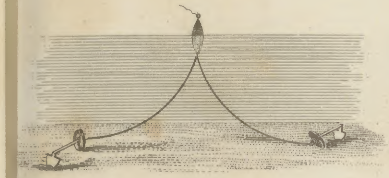

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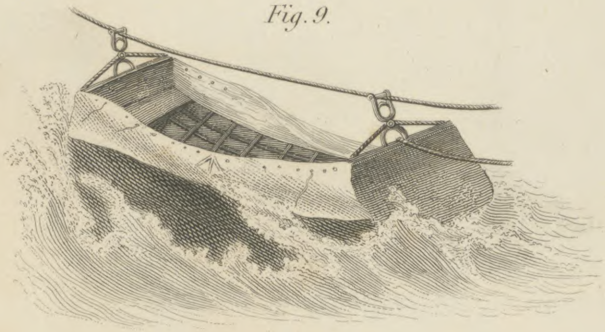

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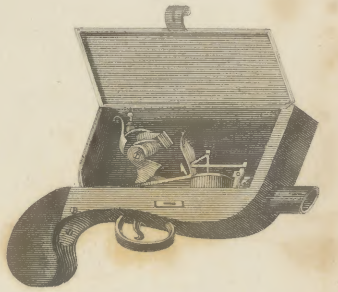

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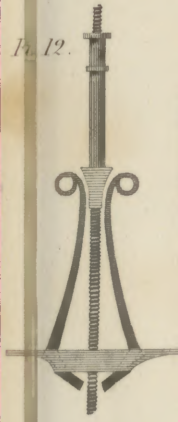
Fig. 12.



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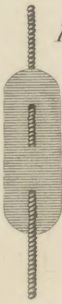

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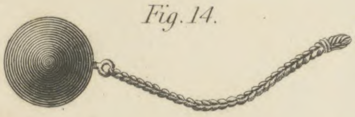

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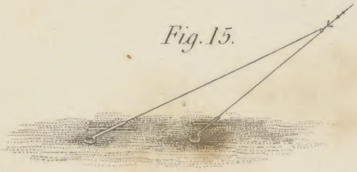

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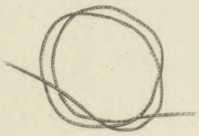

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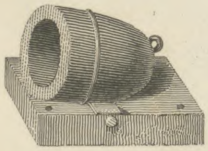

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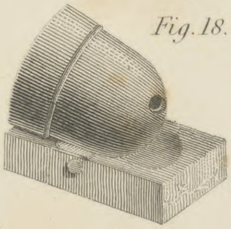

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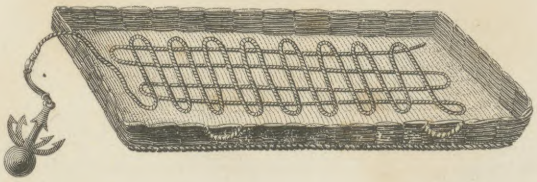

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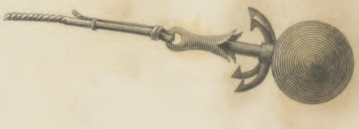

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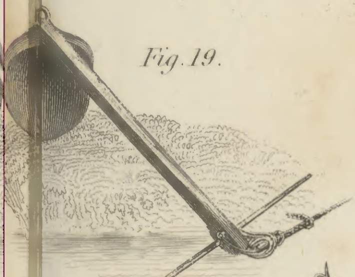

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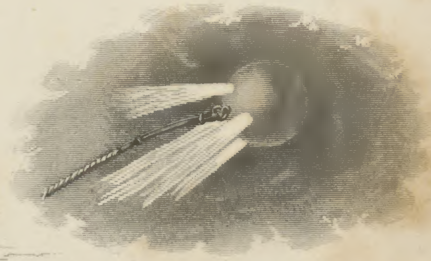

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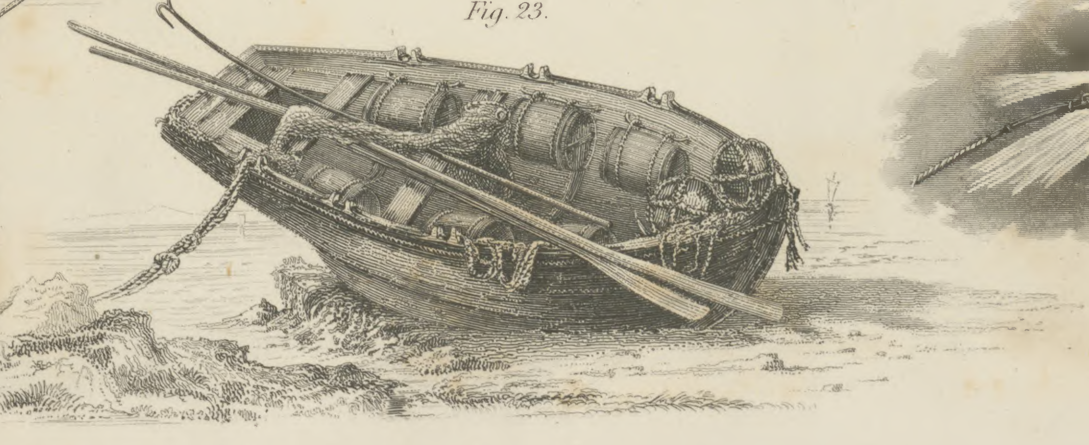

Fig. 22.

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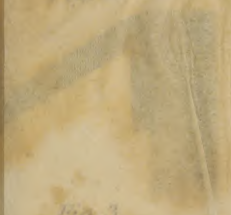
Fig. 1.

Fig. 2.



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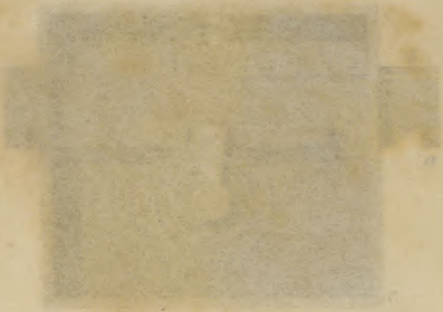

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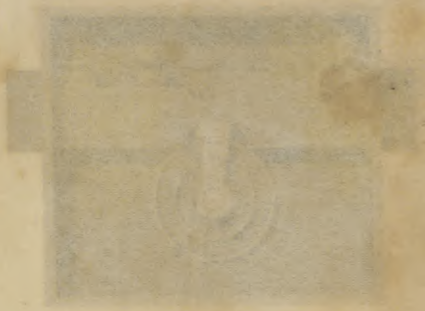

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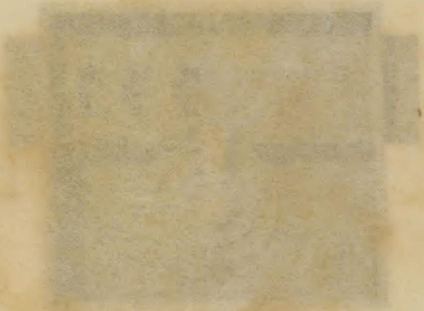

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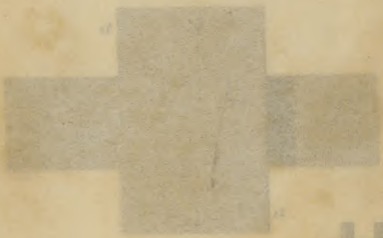

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Fig. 19.

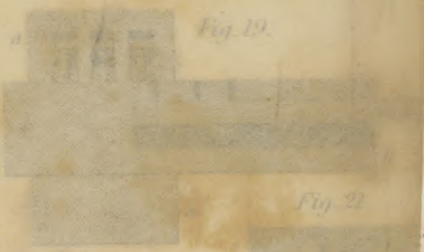

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Fig. 5.

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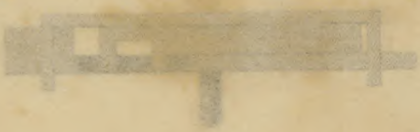

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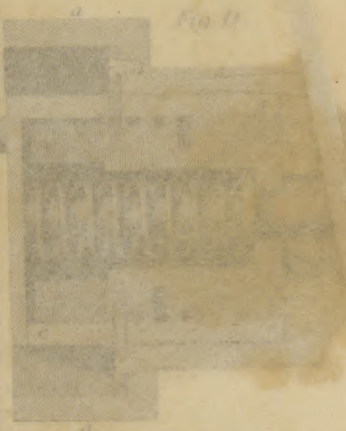

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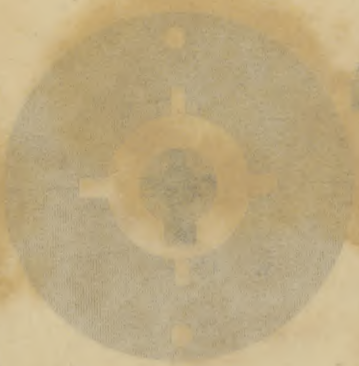

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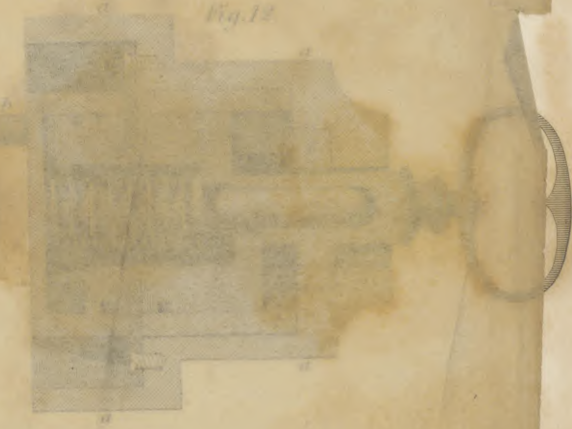

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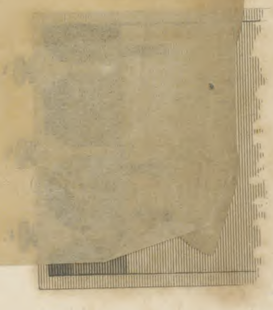

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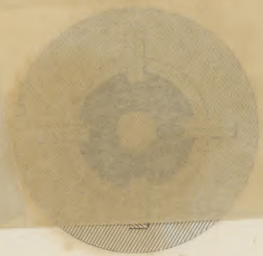

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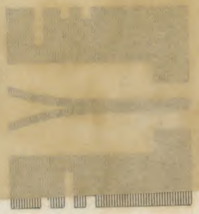

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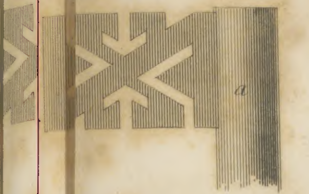

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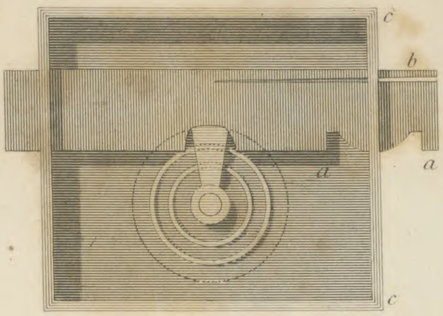

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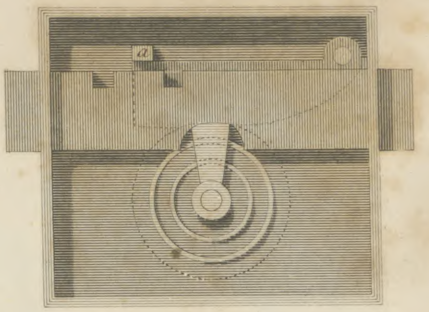

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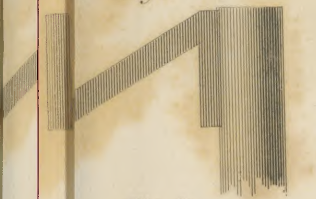

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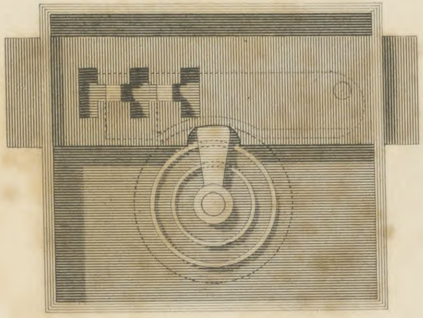

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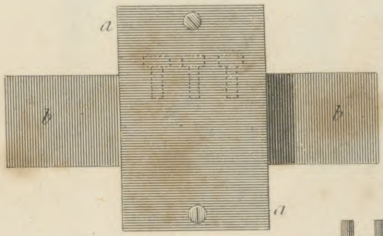

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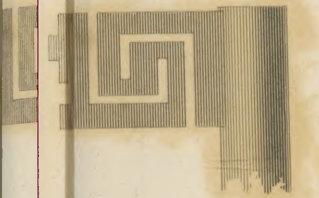

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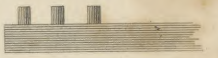

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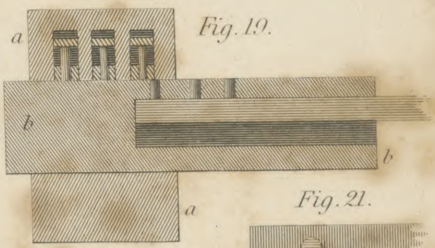

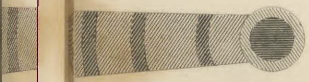

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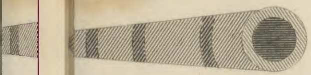

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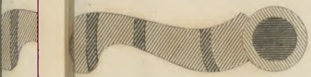

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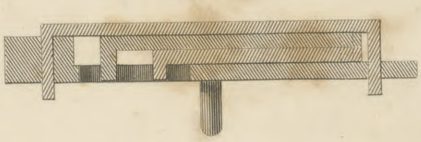

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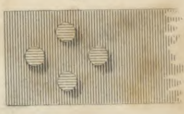

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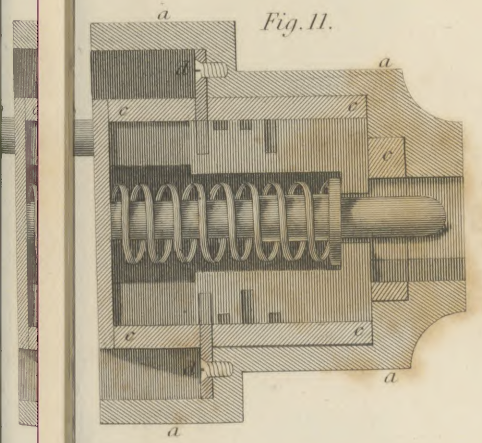

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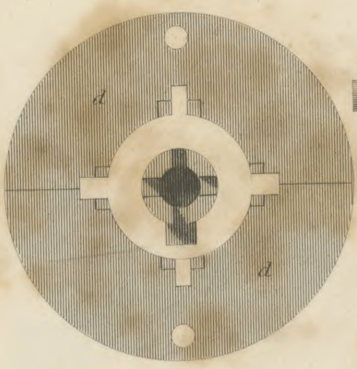

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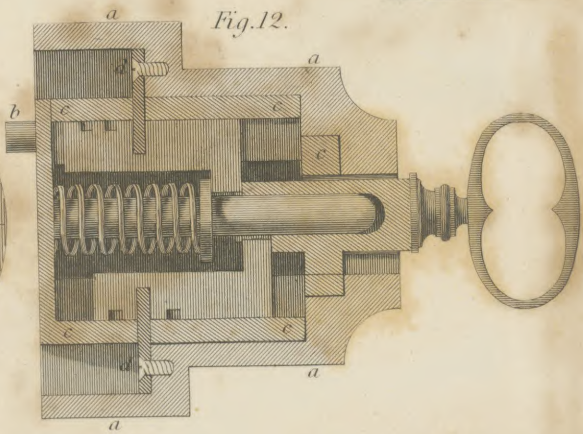

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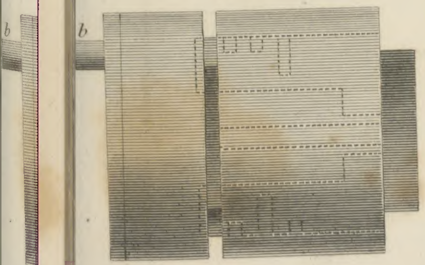

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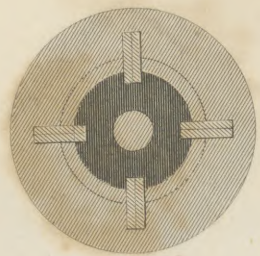

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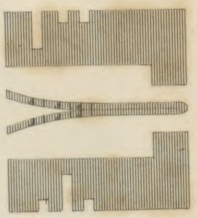

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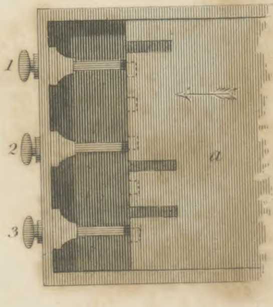

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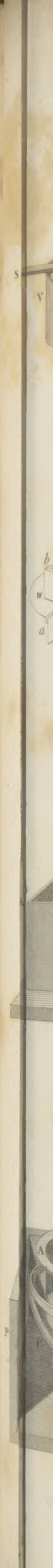
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MAGNETISM.

PLATE CCCXXV.

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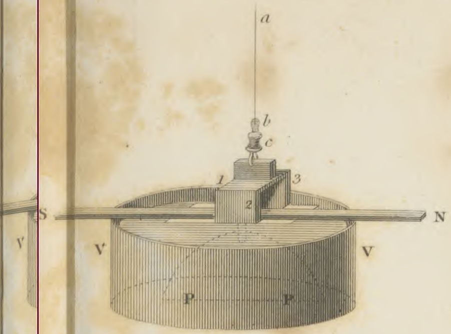

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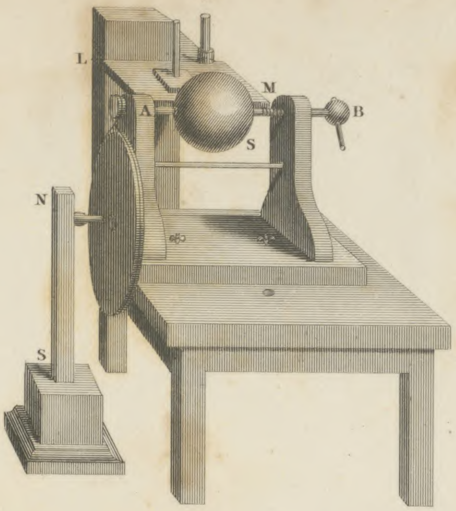

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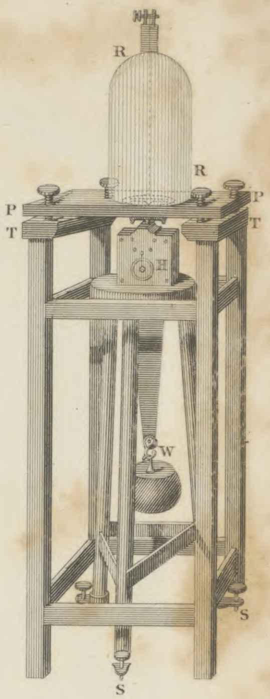

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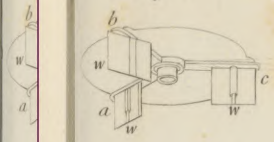

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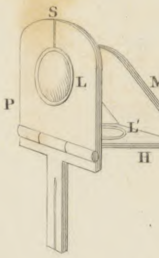

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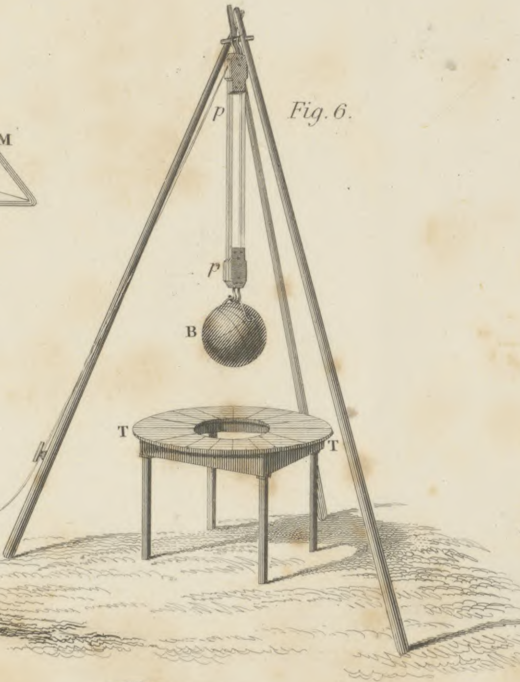

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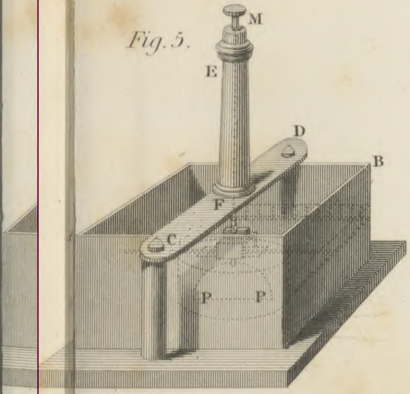

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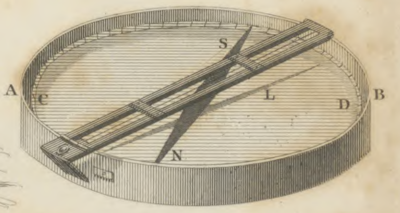

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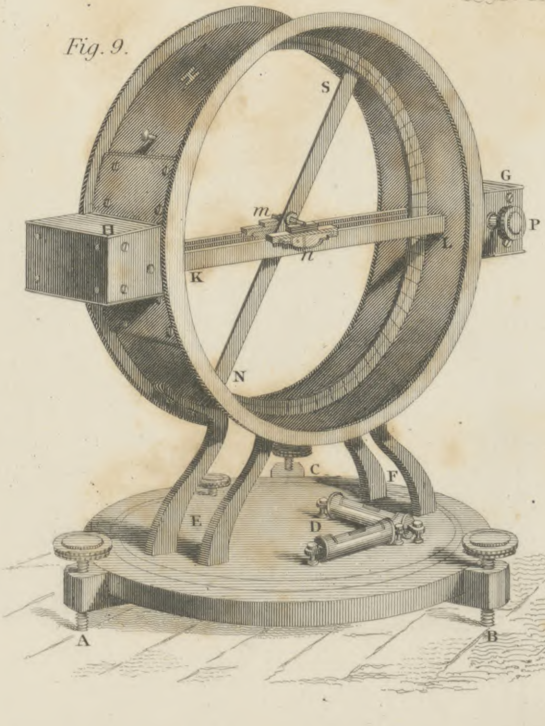

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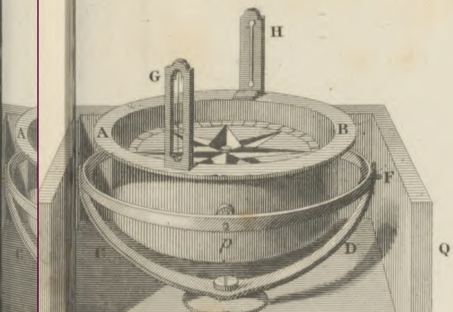

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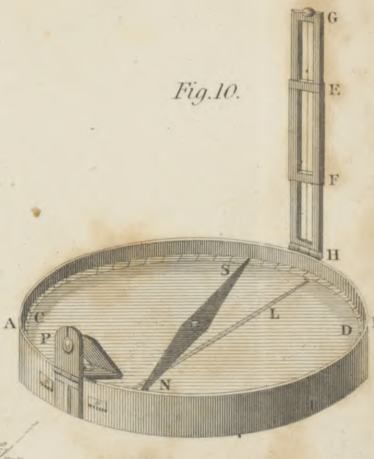

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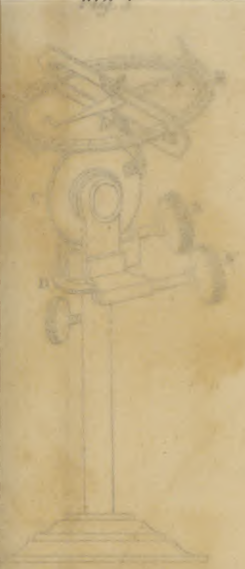

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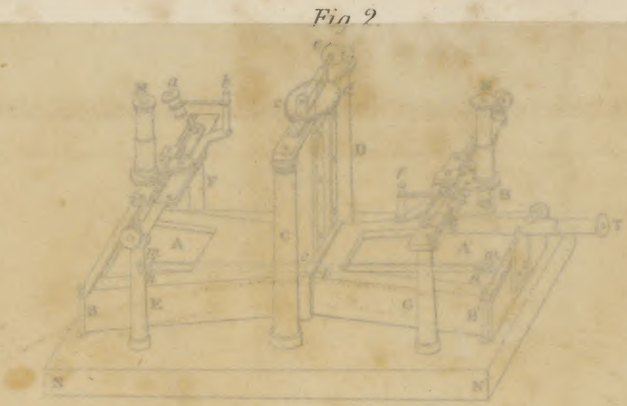

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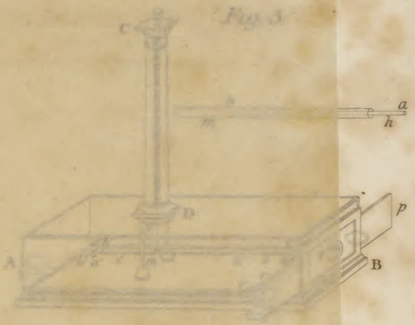

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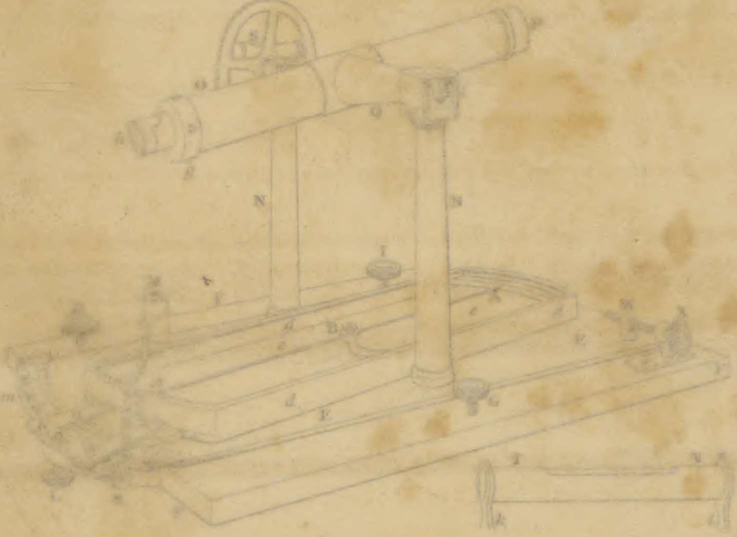
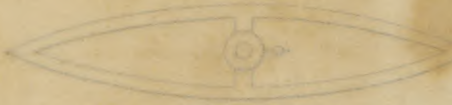


Fig. 10.



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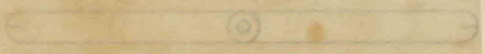

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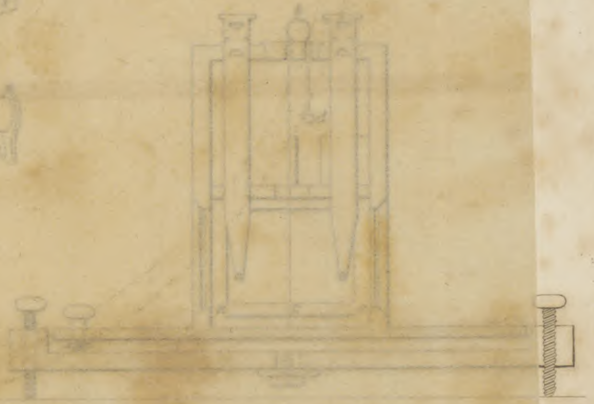

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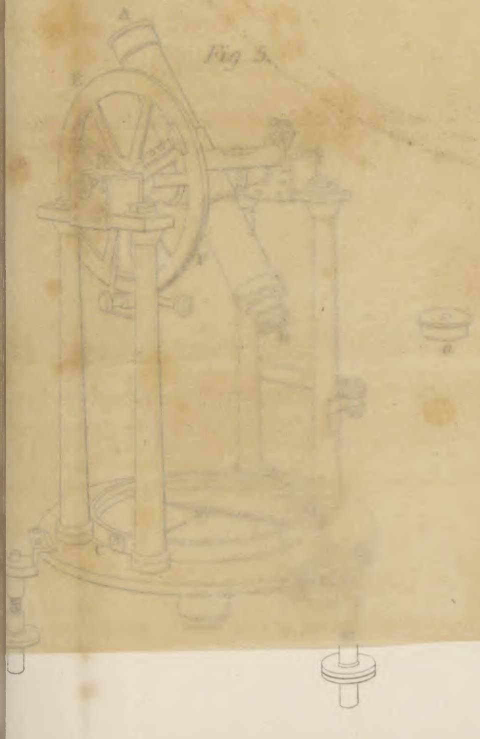

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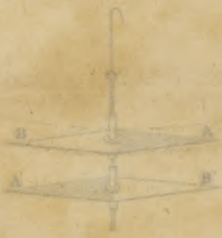

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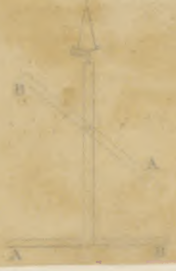

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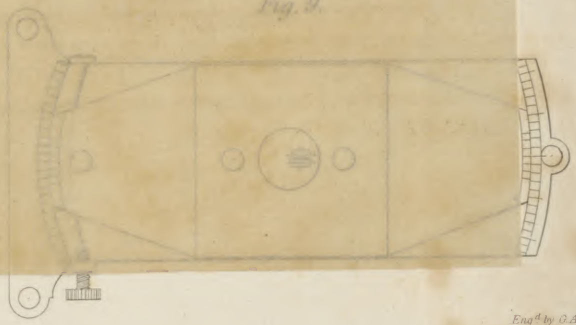

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MAGNETISM.

PLATE CCCXXVI.

Fig. 1.

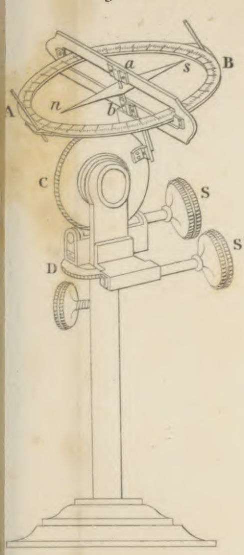


Fig. 2.

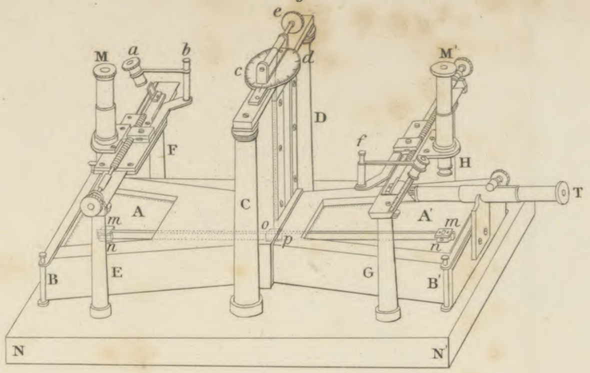
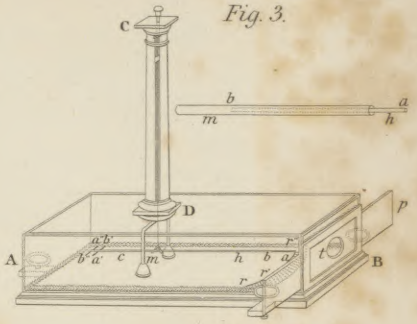


Fig. 3.



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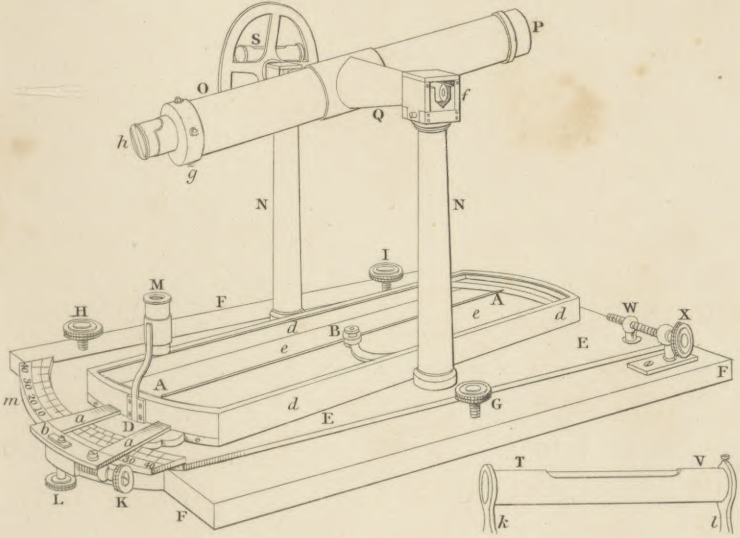

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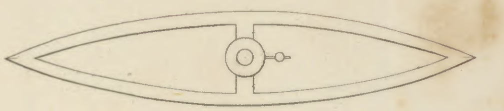

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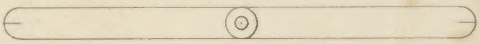

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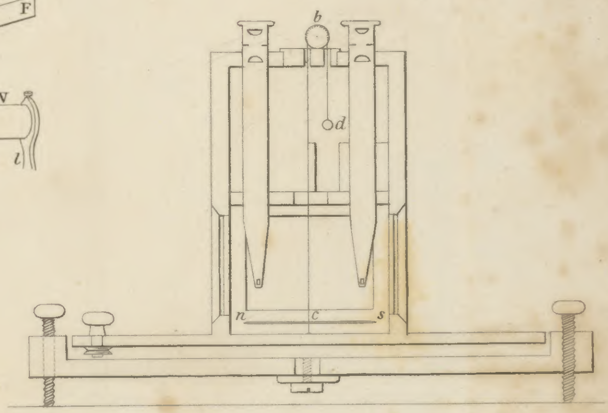

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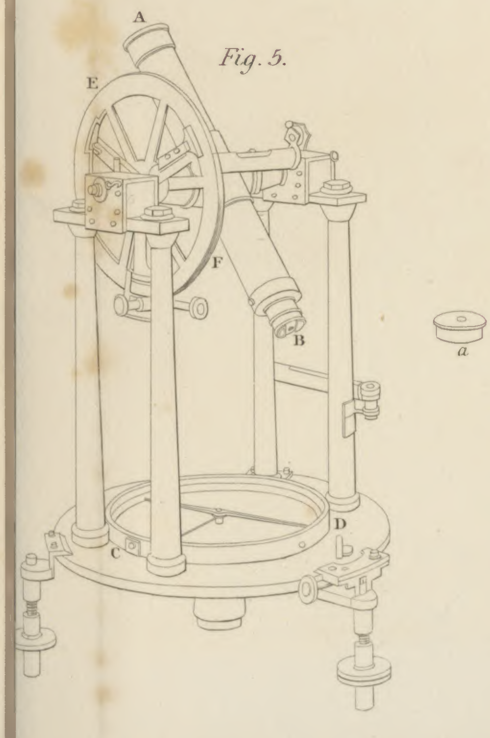

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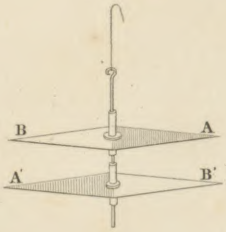

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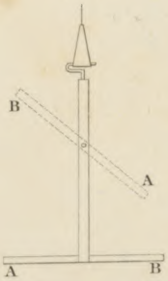

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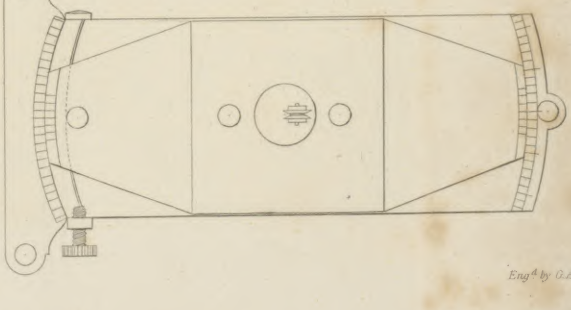

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A CHART OF MAGNETIC CURVES OF EQUAL VARIATION.

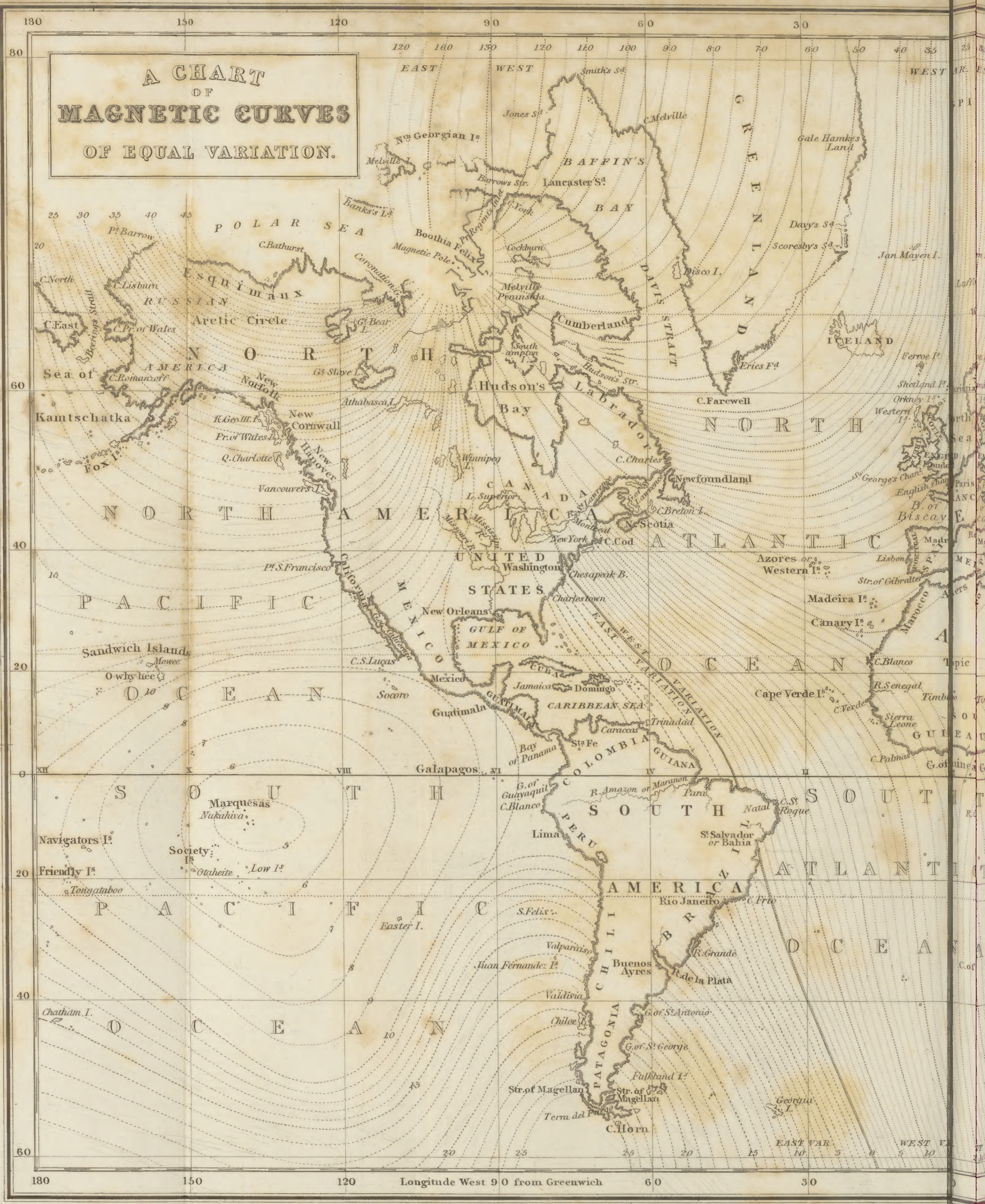
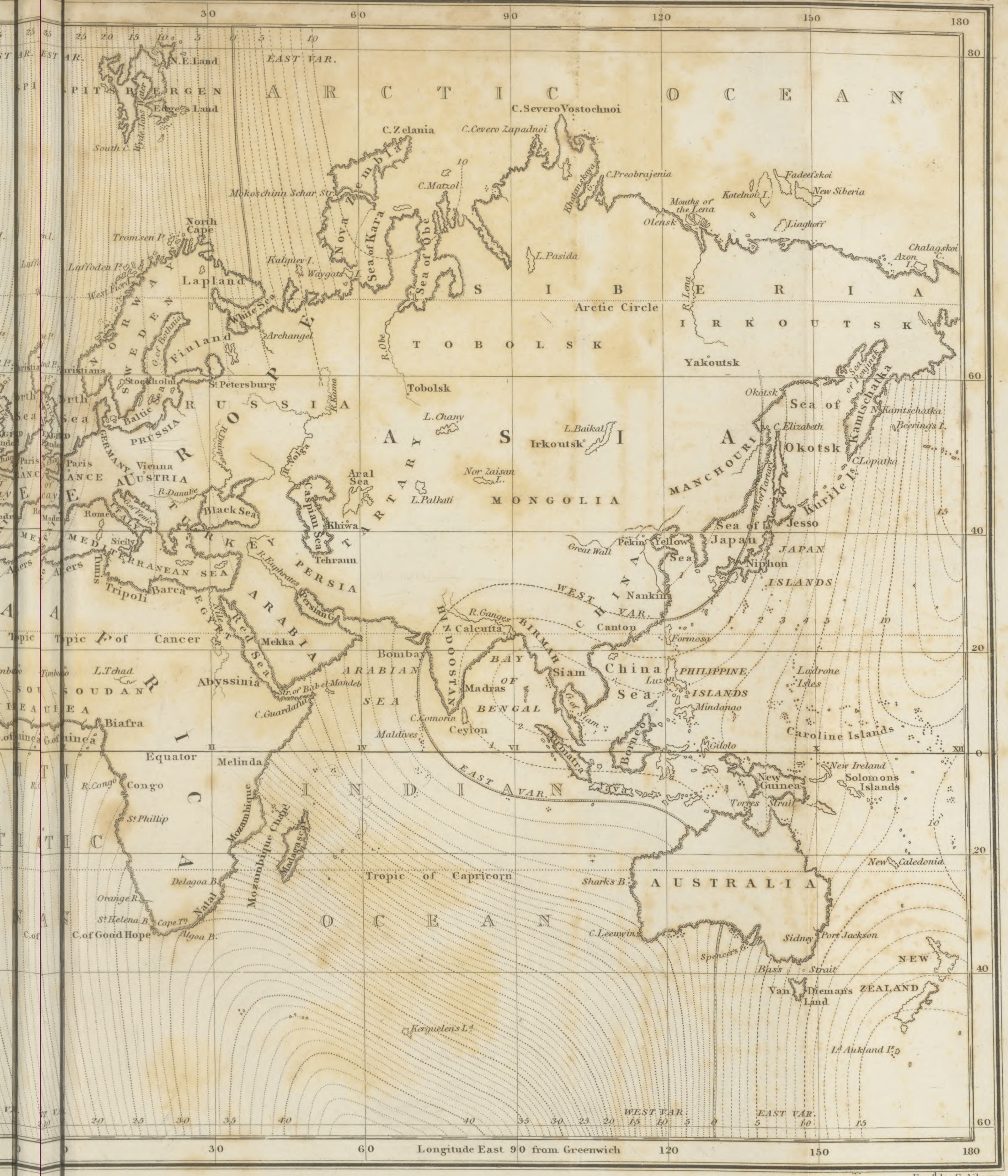


PLATE CCCXXVII.



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